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A
 GENERAL SYSTEM
 OF
TOXICOLOGY,
 OR,
 A TREATISE ON POISONS,
 DRAWN FROM
 THE MINERAL, VEGETABLE, AND ANIMAL
 KINGDOMS,
 CONSIDERED AS TO THEIR RELATIONS
 WITH
 PHYSIOLOGY, PATHOLOGY, AND MEDICAL
 JURISPRUDENCE.

By M. P. ORFILA, M. D.

OF THE FACULTY OF PARIS, PROFESSOR OF CHEMISTRY AND NATURAL
 PHILOSOPHY.

TRANSLATED FROM THE FRENCH.

Unicum signum certum dati veneni est *notitia botanica* inventi veneni
vegetabilis, et *criterium chemicum* dati veneni mineralis.

PLENCK. *Toxicologia.*

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TABLE OF CONTENTS

OF THE SECOND PART OF

THE SECOND VOLUME.

	Page
OF the <i>Upas-Antiar</i>	287
Action of the <i>Upas-Antiar</i> on the Animal Economy . .	ibid.
Of the <i>Ticunas</i> , or American Poison	290
Action of <i>Ticunas</i> on the Animal Economy	ibid.
Of the <i>Woorara</i>	292
Action of the <i>Woorara</i> on the Animal Economy	293
Of Camphor	295
Deleterious Action of Camphor	297
Observations	303
Of the <i>Cocculus Indicus</i>	305
Of Poisonous Mushrooms	311
Of the Agaric	ibid.
Agaric with Incomplete Volva	312
Action of the Agaricus Muscarius on the Animal Economy	ibid.
Observations	313
Agaric with Complete Volva	315
Of the Bulbous Agaric (<i>Agaricus Bulbosus</i> of Bulliard.) .	ibid.
Of the Spring Agaric (<i>Agaricus Bulbosus Vernus</i> of Bulliard)	ibid.
Action of the Hemlock Mushroom (<i>Oronge-Ciguë</i>) on the	
Animal Economy	316
Observations	318

	Page
Of the Mouse-Coloured Mushroom (<i>Agaricus Conicus</i> of <i>Picco</i>)	319
Action of the Mouse-Coloured Mushroom on the Animal Economy	320
Observations	ibid.
Agarics without a Volva	323
Of the Killing Agaric (<i>Agaricus Necator</i> of <i>Bulliard</i>) . . .	ibid.
Of the Acrid Agaric (<i>Agaricus Acris</i> of <i>Bulliard</i>) . . .	ibid.
Of the Caustic Agaric (<i>Agaricus Pyrogalus</i> of <i>Bulliard</i>) . .	324
Of the Styptic Agaric (<i>Agaricus Stypticus</i> of <i>Bulliard</i>) . .	ibid.
History of some other Poisonous Mushrooms	325
Of the Cross of Malta	ibid.
Of the Raven's Eye (<i>Fungus Minimus Totus Niger Umbilicatus</i> of <i>Vaillant</i>)	326
Observations	ibid.
Of the Medusa's Head (<i>Amanita Fasciculosa Pileis Rufofuscis</i> of <i>Dillen</i>)	327
Of the Ivory White	328
Of the Reddish Pointed Milky Mushroom (<i>Fungus Parvus Piperatus Lacteam Succum Fundens</i> of <i>Micheli</i>) . . .	ibid.
Of the Eye of the Olive-Tree (<i>Fungus Perniciosus Intense Aureus</i> of <i>Micheli</i>)	329
Of the Hollow and Poisonous Funnel (<i>Fungus Infundibulum Referens Albus</i> of <i>Buxbaum</i>).	ibid.
Of the Great Mustard-Pot	ibid.
Observations	330
Indications which should excite a suspicion of Mushrooms	335
Action of Alcohol on the Animal Economy	336
Of Sulphuric Ether	342
Of Carbonic Acid Gas	343
Action of Carbonic Acid Gas on the Animal Economy . .	344
Of the Gases which are disengaged during the Combustion of Charcoal.	345
Of Spurred Rye (<i>Secale Cornutum</i>)	348
Action of the Spurred Rye upon the Animal Economy . .	349
Of the Effects of Odoriferous Plants on the Animal Economy	354

	Page
Symptoms produced by the Narcotico-Acid Poisons . . .	356
Lesions of Texture produced by the Narcotico-Acid Poi- sons	357
General Action of the Narcotico-Acid Poisons on the Animal Economy	357
Treatment of poisoning by the Narcotico-Acid poisons .	359

CHAP. VI.—CLASS VI.

SEPTIC AND PUTREFYING POISONS	370
Of the Hydro-Sulphuric Acid Gas (<i>Sulphurated Hydrogen</i>)	ibid.
Action of Hydro-Sulphuric Acid Gas on the Animal Eco- nomy	371
Observations	375
Treatment of the Asphyxia produced by Hydro-Sulphuric Acid Gas	376
Action of certain Putrefied Substances on the Animal Economy	377
Of Venomous Animals	379
Of Venomous Animals, whose bite or sting is accompanied by Symptoms more or less severe	380
Of the Viper (<i>Vipera Berus</i> , <i>Coluber Berus</i> , <i>Anguis Cinerea</i> , <i>Macula Dorsi Fusca</i> , <i>Longitudinali</i> , <i>Dentata Linnæus</i>) .	ibid.
Physical and Chemical properties of the Venom of the Viper	382
Action of the Venom of the Viper on the Animal Eco- nomy	ibid.
Of the <i>Vipera Naja</i> (<i>Coluber Naja</i> of <i>Linnæus</i> . <i>Chinta Na- goo</i> of the Indians, <i>Cobra de Capello</i>)	387
Observations	392
Of the <i>Vipera Elegans</i> of <i>Daudin</i> (<i>Coluber Russelianus</i> . <i>Ka- tuka Rekula Poda</i> of the Indians)	394
Of the <i>Coluber Graminæus</i> of <i>Shaw</i> (<i>Rodroo Pam</i> of the Indians)	398
Of the <i>Gédi Paragoodoo</i> of the Indians (<i>Boa</i> of <i>Russel</i>) .	400

	Page
Of the <i>Bungarum Pamak</i> of the Indians, and <i>Sackeene</i> of Bengal (<i>Boa</i> of <i>Russel.</i>)	401
Observations	ibid.
Of Rattle-Snakes	403
Observation	404

OF INSECTS.

Of the Scorpion	411
Of Spiders	412
Of the Tarantula	413
Of the Bee and the Humble-Bee	414
Of the Humble-Bee	415
Of the Wasp and Hornet	ibid.
Of Animals that produce grievous Symptoms by their Ingestion	417
<i>Clupé Cailleux-tassart</i> (<i>Clupæa Trhyssa</i> of <i>Lin.</i> Yellow Bill of the English)	ibid.
<i>Coracinus Fuscus Major</i> (Gray Snapper of the English.)	ibid.
(<i>Coryphæna Cæruleo Varie Splendens, Cauda Bifurca, Coryphæna Hyppurus</i> of <i>Lacépède</i>) Dolphin of the English	418
(<i>Muraena Major Subolivacea</i>) Conger Eel of the English	419
(<i>Scomber Maximus</i>) King Fish of the English	ibid.
Of Muscles	ibid.
Observations	420
Of Poisonous Animals, whose Fluids have been depraved by Antecedent Diseases	427
Malignant Pustule (Anthrax)	ibid.
Symptoms of the contagious Malignant Pustule	429
Of the Rabies (<i>Hydrophobia</i>)	432
Observations	434
Lesions of Texture observed after the Death of Rabid Animals	439
Treatment of Poisoning by Venomous Animals	440

APPENDIX.

	Page
Corrosive Sublimate (Chloruret of Mercury)	459
Observation	462
Of Charcoal, which has lately been considered as the Antidote to certain Mineral Substances	470
Of the <i>Curare</i>	479
Of the Ligature of the Œsophagus	481
Effects of the Ligature of the Œsophagus upon Dogs . .	482

SECTION II.

OF POISON GENERALLY CONSIDERED.

CHAPTER I.

Of the proper means for ascertaining the existence of Poisoning.

	Page
ARTICLE I.—Of Diseases that might be confounded with Acute Poisoning	488
ARTICLE II.—Of the means, by the assistance of which, we may attain to the knowledge of the nature of the substance which has occasioned the Poisoning	498

FIRST PROBLEM.

To ascertain the nature of the poisonous substance with which any one has been poisoned, when the whole of it has not been swallowed, and the remainder can be procured 499

	Page
§ 1st. Chemical Analysis	499
Solid Poisons	500
Solid Inorganic Substances	502
Examination of the Soluble Substances	503
Poisons, fluid or dissolved	510
Gaseous Poisons	512
§ 2nd. Of the information to be drawn by the Juridical Physician from the Symptoms of the Patient	513
Phenomena which may cause a suspicion that the Poison belongs to the Class of Acrid or Corrosive Substances	514
Phenomena which might excite a suspicion that the Poison ingested belongs to the Class of Narcotics	515
Phenomena which may excite a suspicion that the Poison ingested belongs to the Class of Narcotico-Acrids	ibid.
§ 3rd. Of the information to be drawn by the Juridical Physician from the Organs after the Death of Persons poisoned	516
Lesions of Texture produced by Corrosive or Acrid Poisons	520
Lesions of Texture produced by the Astringent Poisons	522
Lesions of Texture produced by the Narcotic Poisons	ibid.
Lesions of Texture produced by the Narcotico-Acrid Poisons	523

SECOND PROBLEM.

To determine the nature of the poisonous substances with which any one has been poisoned, when it has not been swallowed entirely, and is mixed with Tea, Wine, or other alimentary substances	527
ARTICLE III.—Of Experiments on Living Animals, consi- dered as a means proper for ascertaining the existence of poisoning	530
ARTICLE IV.—Of the means proper for distinguishing whe- ther the Poison has been introduced into the Digestive Canal during Life, or after Death	535
Experiments made with Corrosive Sublimate	536
Experiments made with the Arsenious Acid. (Arsenic of Commerce)	540

CONTENTS.

xi

	Page
Experiments made with Verdigris	541
Experiments made with Sulphuric Acid :	543
Experiments made with Nitric Acid	544
ARTICLE V.—Of the Poisoning of a number of persons at once	548
ARTICLE VI.—Of Poisoning, the result of Suicide or Homicide cide	550

CHAPTER II.

ARTICLE I.—Of Slow Poisoning . . . : : . . .	552
Observations	553
ARTICLE II.—Of Accidents Consecutive to Acute Poisoning	560
Observations	ibid.

TRANSLATOR'S PREFACE.

THE TRANSLATOR has to apologize to the public for the delay that has taken place in the publication of the two last parts of this work, which has been occasioned partly by the ill state of his health, which rendered the task very laborious, and partly by the difficulties which the work itself presented, and which will be readily perceived by those who are conversant with the different sciences of which it treats. His chief endeavour has been, to give to the reader a faithful and literal translation, and, as nearly as possible, in the very words of the accurate author of this work : in doing which he has frequently employed terms not generally used by English writers on the same subjects, yet such as are easy to be understood. *M. Orfila* has every where adopted the latest chemical nomenclature of the French school; and the Translator has judged it most prudent to preserve his language, as far it is intelligible to an English reader, conceiving it to be the only method of giving a just specimen of his work. So also in the various departments of science of which he treats, he every where employs the most modern technical phraseology, as well as in chemistry; so that in many instances, a close Translation would be almost unintelligible : in these instances, therefore, the Translator has been under the necessity of adhering to the language most usually received

TRANSLATOR'S PREFACE.

in this country. Conceiving that, in a work of this description, accuracy was of more importance than elegance of style, the utmost diligence has been employed to adhere closely to the text; and it is hoped, that the want of elegance of diction will be sufficiently compensated by the accuracy of Translation. In the botanical department of this work, the Translator has been frequently embarrassed and put to great difficulties, from the author's having given only the common French name, and not unfrequently a *provincial* name, to a great number of the plants he takes notice of, without adding the Linnæan, or any other scientific appellation. The same difficulties have frequently occurred in the zoological descriptions, and have caused him considerable trouble to identify with certainty the species of plant or animal intended by the author. No one is ignorant of the deficiency of vulgar languages in this respect, or how many different species of plants and animals are frequently confounded under one common name. No pains however have been spared to insure a correct and accurate Translation, which the importance of the subject demanded; and it is hoped that any small defect that may be discovered in the course of so long and laborious a task, will meet with some degree of indulgence. The notes of the Translator have been few and short; they have never been obtruded, except on passages that most evidently required them. They might indeed have been more numerous, and of greater extent, but he has only ventured to comment on, or correct the author, with a timid hand.

TO
ASTLEY COOPER, Esq. F.R.S.

SURGEON TO GUY'S HOSPITAL,

&c. &c. &c.

**THIS TRANSLATION OF
ORFILA'S
GENERAL SYSTEM OF TOXICOLOGY,**

IS

RESPECTFULLY INSCRIBED

AS

A SMALL TOKEN OF RESPECT FOR

HIS PUBLIC CHARACTER,

AND

AN ACKNOWLEDGEMENT OF GRATITUDE AND

ESTEEM

FOR HIS FRIENDSHIP AND PATRONAGE,

BY HIS

MOST DEVOTED SERVANT,

JOHN AUGUSTINE WALLER.

A
GENERAL SYSTEM
OF
TOXICOLOGY.

*Continuation of Class V. and of the Narcotico-Acrid
Poisons.*

OF THE UPAS-ANTIAR.

941. **T**HE Antiar is a tree of a new genus, and the Upas which it furnishes, is the juice which flows from the tree. This juice is milky, bitter, and somewhat yellow. It produces no inconvenience when slightly applied to the tongue, or dropped on the skin; introduced however into wounds, it destroys by an extremely painful death both men and animals. The Indians employ it in their wars. *M. M. Magendie* and *Delile*, on the 28th of August, 1809, read to the Institute a paper, in which they explained the effects of this subtle poison. We shall here report the experiments tried by them, and which we have repeated.

ACTION OF THE UPAS-ANTIAR ON THE
ANIMAL ECONOMY.

Experiment 1st. When six or eight drops of the fluid

juice of the Antiar are poured into an incision made with a scalpel in the thigh of a dog or cat, near the groin, or a small piece of wood is introduced, covered with a grain, or even half a grain, of the Antiar dried, the animal does not appear to suffer any thing for eight or ten minutes; he then vomits twice or thrice, some yellowish matter, of a bilious appearance; he sometimes passes several stools; seldom moves from his place, lies down, and rises up again from time to time. The vomitings, which had ceased, return again after five or six minutes; the respiration becomes noisy, and is interrupted by hiccups and sobs; the muscles of the abdomen and thorax contract; a yellowish and viscid froth covers the edge of the jaws; all at once, the animal utters several loud cries; his head bends back, he falls down on the side, stretches out his limbs, and agitates them in a very irregular manner; the muscles of the face are affected with twitchings; the animal makes irregular leaps, and sometimes strikes himself against some of the surrounding objects; the breathing is executed by starts; a kind of rattling in the throat comes on, which shortly after ceases with life. On opening the body immediately after death, the heart is found to contain arterial blood of a vermillion colour; there is no lesion of the brain; the wound preserves the colour and bitterness of the poison.

Experiment 2nd. When dogs are made to swallow four grains of Antiar, it is observed, that they begin to vomit at the expiration of an hour; the vomitings continue for three or four hours, with long intervals of repose; they pass many stools, and death takes place at the end of eight, ten, or twelve hours.

Experiment 3rd. More than twenty drops of Antiar may be poured upon the sciatic nerve, isolated from the surrounding parts, during the space of an hour, without producing any effect on the animal.

Experiment 4th. If this juice be injected into the jugular vein of dogs and horses, these animals die a few minutes after,

and the symptoms which precede dissolution, are the same as those described in the first experiment. Death takes place somewhat later if the Antiar has been injected into the pleura, or into one of the veins of the mesentery; but in every instance are observed vomitings, purging, cries, and convulsions.

Experiment 5th. When a few drops of Antiar diluted with water, are injected into one of the carotids of a dog, the animal utters a cry at the moment; he experiences no vomiting; the head is twisted; the occiput is bent back upon the floor; the neck and trunk are curved into the shape of an S; the paws grow stiff, and are occasionally agitated. Death takes place in less than five minutes. The injection of the Antiar into the substance of the brain, produces the same effects as the injection into the carotid.

942. It results from these facts,

1st. That the Antiar is extremely poisonous when injected into the carotid artery, the substance of the brain, or the jugular vein; that it is less so injected into the pleura; still less when applied to the cellular texture; and much less still when taken into the stomach;

2nd. That it is absorbed, carried into the circulation, and acts upon the brain and spinal marrow; which is proved by the loss of the senses, by the acute cries, by the turning back or contortion which the head experiences, and by the twitching of the muscles of the face;

3rd. That it acts also as an emetic.

M. Brodie is of opinion, that the Upas-Antiar acts on the heart, which it renders insensible to the action of the blood. He founds his opinion on this circumstance, that very shortly after the application of the Upas, the contractions of the heart are irregular, intermittent, then become weak, and cease immediately after death: this organ is then found distended by a great quantity of blood. (*Philosophical Transactions*, p. 196, year 1811.)

Mr. Emmert has likewise made the same observations on the state of the heart of animals poisoned by the *Antiar*.

OF THE *TICUNAS*, OR AMERICAN POISON.

943. *De la Condamine* informs us, in an abridged account of a journey made through the interior of South America, “ that the *Ticunas* is an extract, obtained by means of fire, from the juice of different plants, and particularly of certain climbing shrubs. They assured me, that there enter more than thirty different kinds of plants and roots into the composition of this poison. The Indians always compound it precisely in the same manner, and follow to the letter the process received from their forefathers, as scrupulously as the apothecaries amongst us, proceed to the solemn preparation of the *Theriaca*. ”*

944. This poison dissolves extremely well in water, and in the mineral and vegetable acids: it produces no effervescence with acids, or with alkalies; it neither turns the juice of radishes red nor green; it dries without cracking.

ACTION OF *TICUNAS* ON THE ANIMAL ECONOMY.

945. It results from the experiments made by *Fontana* on this poison,

- 1st. That its smell, in the dried state, is altogether harmless;
- 2nd. That the same may be affirmed of the vapours which it exhales when placed on burning charcoal, whether inhaled by the nose, or by the lungs; and that consequently what is reported by *La Condamine*, that women condemned to death, are killed by means of these vapours, is false;
- 3rd. That it produces no action when applied to the eyes;

* *Mémoires de l'Académie des Sciences*, ann. 1745, p. 490.

4th. That it is poisonous when taken internally; but that a sensible quantity is necessary to kill even a small animal;

5th. That when applied to the skin scarcely scratched, it is capable of producing death, although not always, nor under all circumstances; the larger animals resist more easily the action of this poison; and when even the weakest escape death, they find themselves in a short time in as good health as before;

6th. That about the hundredth part of a grain of Ticunas is required to kill a small animal, and that it is necessary that the poison be dissolved, in order to produce death, or any sensible derangement in the animal economy;

7th. That the poisoned wounds of the muscles are more fatal than those of the skin, of the ears, and of the combs of fowls;

8th. That the arrows covered with dried Ticunas, are more dangerous and fatal, than the poison dissolved in water, and simply applied to the wounded part;

9th. That the poison of the arrows is more active if they be previously soaked in hot water; their activity is still more increased, if they be dipped in the poison boiled in water, to the consistence of a julap. The symptoms which this poison produces the most commonly, are convulsions, faintings, total deprivation of strength and motion, diminution, or total loss of feeling. It is frequently observed, that the animal, which was at first extremely lively, is deprived a moment after of motion and feeling, and on the point of death. If he does not die, in the course of a few minutes he is as well as before, and does not appear to have suffered any inconvenience, although he has been in a state of lethargy, sometimes for several hours, without giving any certain or manifest sign of life.

10th. That a determinate time is necessary for the American poison to communicate itself to the animal; that this time is much more considerable than that which is required by the

venom of the viper (vide *Venom of the Viper*) to communicate itself; that the effects of the American poison upon animals are more indeterminate and variable; and, lastly, that either of them may be cured by cutting off the parts, when they can be removed without endangering life, provided that the amputation be made in time;

11th. That it instantly destroys life, when introduced into the jugular vein; but does not coagulate the blood like the venom of the viper;

12th. That it produces no sensible change on the economy of the living animal, when applied to the nerves, whether entire, cut, or wounded, provided that they be isolated from the muscles, and other surrounding parts;

13th. That the muscles of animals killed by this poison, are of a paler colour than before; that the veins in the vicinity of the heart are more swelled, and the blood somewhat darker; that the heart, the auricles, and the abdominal viscera, present no alteration; that the lungs exhibit large livid spots; and that, under some circumstances, they appear putrified;

14th. That it attacks the principle of the irritability of the muscles, although it does not affect the irritability of the heart;

15th. That it is not poisonous to snakes and vipers. (*Traité sur le Venin de la Vipère*, par Fontana, tom. ii. p. 83—124. Florence, 1781.)

OF THE WOORARA.

946. The Woorara is a poison, with which the Indians of Guyana arm the points of their arrows: it does not appear to differ much from the *Ticunas*. According to *Bancroft*, it appears to belong to some species of climbing shrub.

ACTION OF THE WOORARA ON THE ANIMAL ECONOMY.

Experiment 1st. A small quantity of Woorara in powder, was applied to a wound made on the side of a Guinea-pig. Ten minutes after, the animal was no longer able to walk, he became completely motionless, except that he exhibited a few slight convulsive movements. A short time after, he was sunk into a state of great insensibility ; his breathing became difficult, and ceased altogether fourteen minutes after the application of the poisonous substance. The thorax was opened: the heart was beating seventy strokes in a minute, and contained blood of a dark colour ; the contractions of the heart continued for several minutes ; the brain and the wound appeared not at all affected.

Two grains of Woorara applied in the same manner, produced the same symptoms at the expiration of twenty-five minutes, and the animal died thirteen minutes after. Its action was more rapid, and shewed itself at the expiration of five or six minutes, when a large quantity was applied, or when a slight hæmorrhage took place of the vessels to which it was applied.

Experiment 2nd. A small quantity of Woorara was introduced into a wound made in a young cat. He was affected by it in a few minutes, and fell into a state of lethargy, and of partial insensibility ; he remained in that state for an hour and a quarter, when the application of the poison was repeated. Four minutes after this repetition, respiration entirely ceased, and he appeared to be dead ; but the heart still beat about a hundred and four strokes in the minute. The animal was placed in a temperature of 85° of Fahr. ; the lungs were artificially inflated at about the rate of four times per minute ; the action of the heart continued regularly ; the artificial re-

spiration was suspended for four minutes; the pupils were seen to dilate or contract as the light was diminished or increased; the saliva flowed from its mouth; a few tears appeared on its eyelids; but it remained insensible and motionless. At the expiration of sixty-four minutes, there were seen some slight involuntary contractions of the muscles, and an appearance of efforts to breathe: these movements continued, and became more frequent. An hour after, he gave, for the first time, signs of sensibility when roused, and breathed spontaneously twenty-two times in the minute. The artificial respiration having been discontinued, he remained forty minutes in a profound sleep, then awoke all at once, and began to walk about. The next day, he appeared somewhat indisposed; but he recovered by degrees, and in the end was restored to perfect health.

Experiment 3rd. A small quantity of Woorara was applied to a wound made in a rabbit: four minutes after, he appeared dead; but the heart did not cease to beat. He was placed in a temperature of 90° of Fahr. (32, 22, Therm. Centigr.) and the artificial respiration was employed. The pulsations of the heart were carried to about a hundred and fifty per minute. For more than three hours the pulse was strong and regular; it became weaker in the end, and an hour after the circulation had entirely ceased. During the whole of that time, there was no appearance of the return of sensibility.

Experiment 4th. The spinal nerves were cut before the place where they unite to form the axillary plexus: a certain quantity of Woorara was then applied to two wounds made in the anterior part of the arm, which produced the same effect, as if the nervous communication had not been intercepted.

Experiment 5th. The thoracic duct of a dog was tied a little before its entrance into the veins: the Woorara was applied to a wound in the posterior extremities, and produced

all the symptoms of poisoning. It was ascertained, by opening the body, that the circulation had been completely interrupted in the thoracic duct.

Experiment 6th. The Woorara was applied to the inferior extremity, and the limb was strongly tied above, to prevent all communication by means of the blood-vessels. The animal did not experience any of the effects peculiar to this poison, and did not die. (*Philosophical Transactions*, year 1811, p. 194, *et sequent.* *Mémoire de M. Brodie*, year 1812.)

947. *M. Brodie* concludes from these facts,

1st. That the Woorara is absorbed by the veins;

2nd. That it destroys the functions of the brain, and consequently that respiration ceases in a short time after.

OF CAMPHOR.

Physical and Chemical Properties of Camphor.

948. Camphor is a vegetable substance, considered as one of the numerous immediate productions of vegetables. Chemists have already discovered it in several of the laurels, in a great number of the *Labiatae*, and in some of the *Umbelliferae*. Among the laurels, the species designated by the name of *Laurus Camphora*, Lin., is that which contains the greatest abundance. This plant abounds in China and Japan; the Camphor may be extracted, by boiling in water the roots and wood cut into small pieces; the Camphor then quickly becomes volatilized, and attaches itself to small pieces of rice straw, previously disposed in the inside of a cap of earth, with which the iron pots in which it is boiled are surmounted.

The Camphor thus obtained, is in the form of small grains of a grayish colour, which are purified in Holland, in England, at Berlin, and Paris: to this effect, they begin by removing, by means of a sieve, the more gross extraneous bodies; they then mix it with about a sixteenth part of slacked lime, or

of carbonate of lime, and sublime it with a gentle heat, in matrasses of glass flattened at the neck and base.

When Camphor is to be obtained from the *Labiata*, they begin by separating the essential oils with which it is united, and leave them to a spontaneous evaporation; by this means the oils become volatilized, and the Camphor remains behind. *M. Proust*, who was the first that made known this method, has extracted a sixteenth part of Camphor from the essential oil of rosemary, a ninth part from that of marjoram, a seventh from that of sage, and more than a fourth from that of lavender. (*Ann. de Chimie*, tom. iv. p. 179.)

There is yet one other plant which, according to *M. Correa de Serra*, has the greatest affinity to the *Shorea Robusta*, from which Camphor may be extracted, which the orientals esteem more than that of the *Laurus Camphora*. The tree which furnishes it grows in Sumatra. All that is necessary in order to obtain this *immediate principle* is, to make an incision, and to wash the production which flows from it: by this means it is freed from extraneous bodies.

Thus purified, the Camphor is a solid substance, of a white colour, transparent, and lighter than water; its specific gravity is as, 0,9887; it is of a fatty consistence; it is ductile, granulated, and its taste is bitter, hot, and pungent; its smell is very strong, and rather disagreeable; it crystallizes commonly in pyramids of six faces, or in square layers. When exposed to the action of heat in close vessels, the Camphor volatilizes with the greatest facility; it is even volatile at the ordinary temperature, as any one may be convinced by examining the crystals formed on the upper part of the drawers in which it is commonly kept.

When ignited in the open air, it burns with a white flame, after the manner of substances highly hydrogenated; it exhales an abundant vapour, and becomes decomposed. This experiment may be made by putting a small piece of Cam-

phor on water, and applying to it a body in a state of combustion.

Water can only dissolve $\frac{1}{1152}$ part of its weight of Camphor; but it may be combined with this fluid, by means of some mucilaginous body.

Alcohol and common brandy dissolve a tolerably large quantity of it: these solutions are decomposed by water, and the Camphor is precipitated of a white colour. The product is dissolved in a fresh quantity of alcohol.

The acetic acid copiously dissolves Camphor; it may even be said that it is its best solvent.

The nitric acid likewise dissolves this *immediate principle*, and the fluid separates into two portions; the one, superior, having an oily appearance, contains a great deal of Camphor, and of highly concentrated nitric acid; the other, inferior, but little camphorated, contains nitric acid very weak. It appears then that Camphor possesses to a certain degree the property of separating from the nitric acid a great quantity of water, acting thus in a manner similar to the salifiable bases. However that may be, the mixture resulting from the action of these two substances, when distilled several times, furnishes a certain quantity of Camphoric Acid, the formation of which implies the decomposition of part of the nitric acid. In fact, the oxygen acts upon the hydrogen and carbon of the Camphor, and nitrous gas is disengaged.

Olive oil is capable of dissolving a very great quantity of Camphor, provided the temperature of the mixture be a little raised.

DELETERIOUS ACTION OF CAMPHOR.

949. Camphor, when introduced into the stomach of dogs in the dose of two or three drachms, produces serious symptoms, followed almost constantly by death; its deleterious properties are still more energetic if injected into the veins.

What is the mode of action of this poisonous substance?

Experiment 1st. A dog of small size was made to take two drachms of Camphor, triturated with the yolks of two eggs. At the end of six minutes, the animal seemed to be agitated; he ran rapidly round the laboratory, stopped all at once, resting strongly upon his fore feet, agitating the muscles of the face in a convulsive manner. A moment after, the convulsions became general; he fell down on the side, having the head strongly reflected backward, and his extremities in a state of extreme agitation; the eyes, which were starting, and, as we may say, out of their sockets, presented a remarkable injection of the conjunctiva, and were insensible to external impressions: the animal could not hear, and had entirely lost the use of his intellectual faculties; the mouth was filled with a thick foam; the tongue and gums were somewhat livid; the breathing difficult, and accelerated. At the end of this attack, which lasted four minutes, the animal vomited a small quantity of soft and fluid matter, composed partly of the substance ingested; he instantly rose up, and suffered no more afterwards.*

Experiment 2nd. Three drachms of Camphor, dissolved in an ounce and half of olive oil, were given to a dog of middle size; the ligature of the œsophagus was made in order to prevent vomiting. After a few minutes, the animal appeared restless, he staggered in his walk, and the muscles of the head exhibited some convulsive movements. These symptoms were immediately followed by a general attack, which lasted nearly a minute and a half, and during which the animal remained lying down on the side; his head was nearly in the usual position, and all the muscles in a state of great agitation; the organs of the senses were insensible to the surround-

* I repeated with *Dr. Courrant*, my friend and pupil, the greatest part of the physiological experiments concerning Camphor and the *Cocculus Indicus*; and he made them the subject of an inaugural dissertation, which he sustained at Paris, in the month of January, 1815. No. 5.

ing objects; the eyes were starting from the head, and the breathing as it were suspended. After the cessation of these symptoms, he remained twenty minutes without appearing to experience any notable action on the part of the poison; he walked about freely, and seemed to have recovered the use of his senses. A moment after, he began to experience a difficulty in walking; his head was thrown back, as it were by shocks, and the anterior limbs grew weak; at one time making a few steps backwards, he stopped all at once to support himself on the hind legs; at another time, he turned round, describing a circle of a tolerably large diameter. This state of things continued ten minutes: then a most violent attack commenced; the animal all at once fell backwards, reflecting back the head upon the vertebral column, as if to tumble over; the muscles of the whole body, especially those of the extremities, and of the lower jaw, were agitated with great violence; horrible cries attested the pains to which he was a victim; the insensibility of the organs of sense became complete; the mouth was filled with foam, the tongue and gums were somewhat livid; the breathing, which was very laborious, was accompanied by the exhalation of a smell of Camphor. The animal expired in this state seven minutes after the beginning of the last attack. He was immediately opened, and the blood in the left ventricle was found to be of a deep red colour, the lungs were subsided, of a texture more tight than usual, and visibly injected.

This experiment was repeated on several other dogs, which were only made to take two drachms of Camphor, and presented the same results.

Experiment 3rd. At eleven in the morning, three drachms of Camphor dissolved in four ounces of oil, were introduced into the stomach of a small and extremely weak dog, and the œsophagus was tied. At half past eleven, the animal had a convulsive attack, which lasted five minutes. At half past twelve, a fresh attack. At a quarter past two, continued con-

vulsive movements in the different parts of the body, and especially in the muscles of the jaws; the mouth almost constantly open. At five, in the same state; the animal had not ceased for an instant to have the mouth open, as if he sought to introduce a greater quantity of air. At six, he was expiring: he died an hour after. He was opened the next day: the stomach contained about two ounces of a brownish stringy fluid; the mucous membrane, which was inflamed, presented several longitudinal bands of a bright red, and others of a circular form of a blackish red; there was no ulceration. The brain was not the seat of any remarkable alteration.

A similar result was obtained on giving to another dog two drachms of Camphor dissolved in three ounces of oil.

Experiment 4th. When fifteen or twenty grains of Camphor dissolved in three or four drachms of oil of olives are injected into the jugular vein of a dog, it is observed that the injection is scarcely terminated before the animal experiences all the phenomena which we have just described in the preceding experiments, and he dies in the course of four, six, or eight minutes, according to his strength.

Experiment 5th. At two o'clock, six grains of Camphor dissolved in three drachms of oil of olives, were injected into the jugular vein of a small and very strong dog. At six in the evening, the animal, who as yet had experienced no inconvenience, had vertigoes; his posterior extremities were feeble, his breathing somewhat difficult, the pulsations of the heart as before the operation. He died the next morning at four o'clock. The digestive canal appeared sound; the lungs contained air, and were infiltrated with serosity.

Experiment 6th. Six grains of Camphor dissolved in the smallest possible quantity of oil, were applied to the cellular texture of the back of a robust dog. Five days after, the animal had suffered nothing, and took his food with an appetite.

Experiment 7th. The same experiment was repeated upon

a dog of middle size, with the same dose of Camphor and oil, which was placed in contact with the cellular texture of the inside of the thigh. At the expiration of ten hours, the animal had not experienced any sensible phenomenon. Twenty-four hours after the application, he was under the influence of the poison, and was in a state of agitation; the limbs exhibited convulsive movements, and he died two days after. The limb operated on presented no remarkable alteration; the bladder was full of urine; the other organs appeared to be sound.

This experiment being repeated, furnished the same results.

Experiment 8th. The œsophagus of a small dog tolerably robust, was detached and perforated: half an ounce of Camphor divided into small pieces was introduced into his stomach, enclosed in a paper cone; the œsophagus was tied, to prevent vomiting. The animal died two days afterwards, without having been agitated by any convulsive movements, or uttering the least complaint; he had only been in a state of great dejection. On opening the body, it was observed, that the stomach contained a few pieces of Camphor, floating in a blackish stringy fluid, which lined the inside of this viscus; the mucous membrane, which was of its natural colour, presented, near the pylorus, four longitudinal ulcers, covered by a black substance, which could easily be detached. The edges of these ulcers were elevated with some considerable projection.

Other dogs, upon which this experiment was repeated, and that had only been made to take three drachms of Camphor in fragments, presented the same phenomena, except that death did not take place sometimes until the end of the fourth, or of the sixth day.

Experiment 9th. Half an ounce of Camphor in fragments, about half of which was still more divided, was introduced into the stomach of a large dog, whose œsophagus was tied. Four hours after the operation, the animal experienced all

the nervous symptoms described in Experiment 1st., with this difference, that the attack, although violent, appeared every instant to be at an end, and to be immediately renewed. Its duration was six minutes. After this attack the animal continued in a state of extreme dejection, and he did not die till six days afterwards. The body was opened, and it was observed, that the internal surface of the stomach was sprinkled over with ulcers.

Experiment 10th. We wished to ascertain what was the action of the artificial Camphor, prepared according to the process of *Kind*, by passing a current of muriatic acid gas through oil of turpentine. To this end, a robust dog was made to take half an ounce of this substance dissolved in an ounce and half of oil of olives, and none of the effects resulting from Camphor, were produced in the animal. He was dejected, and did not die till the seventh day. On inspecting the stomach, several small ulcers of an oval figure were observed, but which differed totally in appearance from that in Experiment 4th, produced by the natural Camphor.

950. From all the preceding statements we may conclude :

1st. That when three or four drachms of Camphor, divided by any oil, are introduced into the stomach of a dog, the Camphor is quickly absorbed, carried into the circulation, and that it acts by powerfully exciting the brain, and the whole nervous system, and by producing death in a very short time, amidst the most horrible convulsions.

2nd. That when it is directly mixed with the blood, by means of injection into the veins, it produces the same phenomena, but in a manner much more rapid.

3rd. That it produces the same symptoms, but in a manner much slower, when applied to the cellular texture of the inside of the thigh.*

* In employing frictions with Camphorated oil, to the interior part of the thigh, in the human species, a direct action is observed to take place on the kidneys and bladder. Some years ago, several practitioners

4th. That, in almost every case, the animals die of the asphyxia which results from the cessation of the respiration, or at least from the difficulty with which that function is carried on during the violent convulsive succussions.

5th. That the analogy which exists between the action of Camphor, and that of the different species of *Strychnos* described by *M. M. Magendie* and *Desportes*, is not sufficiently great for us to consider their effects as identical, the *Strychnos* affecting particularly the spinal marrow, whilst the Camphor acts on the whole nervous system, and especially on the brain.

6th. That Camphor is not digested, and that it exerts a local action capable of producing ulcerations of the mucous membrane of the stomach, and consequently death.

7th. That if Camphor in fragments produce nervous effects, it is in consequence of a more minute division of some of its parts.

8th. Lastly, that the artificial Camphor in the dose of half an ounce, even when divided by oil, produces no lesion of the nervous system, and confines its action to the production of a few small ulcers in the mucous membrane of the stomach.

951. In order to conclude the history of the deleterious qualities of Camphor, we shall here present some observations, which tend to prove that this substance acts on the human species as on dogs.

OBSERVATIONS.

1st. M. of a spare rather than gross habit, with a white skin, and red colour in the cheeks, of a constitution seldom injured by diseases, but subject to slight nervous affections, had experienced for several days a constriction of the

of Brest employed this method with success, in order to moderate the irritation produced by blisters on these organs. *M. Chrestien* likewise reports an observation of this kind. It is to be presumed, that the Camphor, under these circumstances, is absorbed.

sphincter of the anus, which caused him at times very sharp pains. During this time he had recourse to mucilaginous glysters, but without experiencing from them any relief. Half a drachm of Camphor was prescribed to be added to the glyster; he only took eighteen grains; the pain was entirely suspended for about an hour. The next day, half a drachm of Camphor was administered to him in a glyster; a few minutes after, he felt a taste of Camphor in the throat; at the expiration of a quarter of an hour, not having passed the glyster, he experienced a sensation of inquietude, and a general uneasiness. As that painful state continued to increase, he jumped out of bed, and was surprized to find himself lighter than usual; it appeared to him that he scarcely touched the ground, and that he skimmed it, as it were, in walking. He went down stairs to seek assistance; his step was uncertain and staggering; he walked about, making gesticulations, and begging with great earnestness a glass of wine. His face was pale; his eyes haggard; his features altered: he experienced a slight coldness over the whole extent of the skin, with a sense of numbness in the hairy scalp, but more especially at the back of the neck; the skin was cool, and moist in some places; the pulse feeble and tight: it appeared to himself, that he had a disposition to fainting; his senses were particularly affected; he was in a state of lively inquietude, and yet did not believe that he was in danger. He was under great emotion, and shed tears, which much astonished him, because he felt that they were without motive, and that he could not stop them, as they were involuntary. In this situation he continued about half an hour, the symptoms gradually diminishing. The wine which he took contributed greatly to his recovery. He exhaled by the mouth a very strong smell of Camphor, which continued the whole day; the painful constriction was not felt during the whole of this time; it did not return till four and twenty hours after,

and gave way at last entirely to twelve grains of Camphor administered in two doses in the same manner. (Observation communicated by *M. Edwards*.)

2nd. A man, who was subject to an hypochondriacal affection of the most severe kind, and which was the cause of very frequent spasmodic symptoms, swallowed by mistake, at one single dose, two scruples of Camphor dissolved in oil of olives: the effects of this act of imprudence were, vertigo, coldness of the extremities, great anxiety, a cold sweat over the head, slight delirium, accompanied with drowsiness; the pulse was small and languishing. To these symptoms shortly succeeded a considerable heat, a more frequent pulse, red urine; but the patient was soon after made amends for this accident, being entirely freed from his spasms. (Report from *Hoffmann* by *M. Hallé*, in a Memoir inserted among those of the *Société Royale de Médecine*, p. 66.)

OF THE *COCCULUS INDICUS*.

952. The *Cocculus Indicus* is the fruit of a shrub, which grows naturally in the sand, in the midst of the rocks, on the Coast of Malabar, in the Island of Ceylon, and in other parts of the East Indies. It is found more particularly under the shade of great trees, the trunks of which it embraces, climbing up even to the highest branches.

This fruit is blackish, of the size of a large pea. The ligneous pericarp is covered with rugosities, and contains a kernel of a bitter taste, remaining a long time whitish, brittle, round, sometimes oblong, and somewhat kidney-shaped, divided into two parts or lobes, by a sinuous partition, well defined, and as it were ligneous.

M. Boullay, a celebrated apothecary at Paris, and a distinguished chemist, has lately endeavoured, at the solicitation of *Professor Chaussier*, to ascertain the nature of the principles which enter into the composition of the fruit of the

Menispermum Cocculus. From the analysis of it, given by him, it results, that the seed of this fruit, when isolated from the ligneous perisperm in which it is enclosed, contains, 1st, about half its weight of a fixed oil, *ceraceous concrete*; 2nd, an albuminous vegeto-animal substance; 3rd, a particular colouring matter; 4th, 0,2 of a new bitter principle, crystallizable and poisonous, to which *M. Boullay* has given the name of *Picrotoxine*; 5th, 0,5 of a fibrous part; 6th, some malic acid, probably in the state of acidulous malate of lime and potash; 7th, sulphate of potash; 8th, muriate of potash; 9th, a calcareous phosphate; 10th, a small quantity of iron and silex. (*Analyse Chimique de la Coque du Levant*, Paris, 1812.)

953. The deleterious effects produced on fishes, birds of Paradise, goats, and wild cows, crocodiles, &c., have induced some physicians to make experiments on living animals, with the intention of ascertaining its mode of action.

M. Goupil, a physician of Nemours, has communicated to the Society of Medicine some interesting facts on this subject. The following are the conclusions, which he is of opinion may be drawn from his labours :

1st. The *Cocculus Indicus* is not only a poison for fishes, but also for different carnivorous quadrupeds, and very probably for the human species.

2nd. That this poison may be classed amongst the irritating vegetable poisons.

3rd. That the ligneous covering of the *Cocculus Indicus* possesses only an emetic property, even to fishes, and in proportion to the dose in which it is administered.

4th. It is in the kind of kernel contained in this covering, that the poisonous property resides.

5th. That the poisonous part of this substance is not sensibly changed by the gastric juices, and the vital action of the organs of digestion.

6th. That it passes, on the contrary, into the absorbent

system with all its properties; the flesh of those fishes that have eaten it, irritates the stomach and bowels of the animals to which it is given, nearly in the same manner as the *Cocculus Indicus* itself.

7th. All the fishes who eat it do not die in an equal space of time. Roach, pollard, breme, perch, tench, barbel, such is the order nearly in which these fishes appear to resist: the roach is killed the easiest of all; the barbel is the last to die. The barbel is, of all fish, that whose flesh the most frequently occasions accidents in those animals who eat it, probably because these fish taking a longer time to die, the poison is longer subjected to the action of the digestive juices, and a considerable quantity of it is consequently absorbed. (Bulletin of the Society of Medicine, November, 1807.)

M. Boullay, in his treatise on the *Cocculus Indicus*, asserts, that a grain of *Picrotoxine*, mixed with one *gramme* of crumb of bread, proved sufficient to kill a strong frog that was made to swallow it; whilst the concrete oil, the vegetable substance, the colouring part, and the water distilled from this seed, produced no ill effects on the same animals, which were made to swallow much more considerable quantities.

M. Boullay concludes from these experiments, that the *Picrotoxine* is the only matter to which the *Cocculus Indicus* owes its deleterious powers.

In comparing the effects of the *Picrotoxine* with those of the *Cocculus Indicus*, we have endeavoured to ascertain the mode of action of these two substances.

Experiment 1st. When robust dogs are made to swallow three or four drachms of the *Cocculus Indicus* as finely pulverized as possible, and the œsophagus is tied immediately after the ingestion of the poisonous substance, it is observed that these animals very quickly make repeated efforts to vomit. At the end of twenty, twenty-five, and thirty minutes they begin to stagger; their eyes appear haggard and project-

ing ; their muscles become agitated with a trembling, at first slight, but which gradually increases ; in a short time afterwards, their features become greatly altered by the convulsive movements of the different muscular parts of the face ; contortions, and horrible grimaces give notice of a general nervous attack ; all at once they make a few steps backwards, stretch out the fore paws ; they stop, and with difficulty avoid falling while they attempt to rest on their posterior extremities. The head in a short time experiences a violent shock, similar to that resulting from a strong discharge of the electric fluid on frogs ; these commotions are sometimes so violent, that this part is bent backwards upon the trunk, and a tumble is produced backwards, in which the head first strikes the ground with violence, and the body is rolled round in every direction. These effects cease for a minute or two ; the animals rise up, attempt to advance a step or two forward, but are soon attacked again : the severity and frequency of these paroxysms go on increasing, and the most alarming convulsions are perceived ; lying down commonly upon their side, they agitate their paws with extreme rapidity and violence ; the head and tail are more or less reflected upon the posterior part of the vertebral column ; the organs of sense no longer exercise their functions, and any one may move the animals, push them, and make any noise near them, without their shewing the least sign of perception : the mouth becomes full of foam, the tongue and gums are more or less livid, the conjunctive membrane injected, the breathing accelerated and laborious ; sometimes in this general contraction, an involuntary emission of urine and excrement takes place. This situation continues two or three minutes, the animals appear calm for a few seconds, and quickly fall again into a fresh paroxysm ; at length they finish, by expiring after one or two attacks. Death commonly takes place half an hour or an hour after the ingestion of the poison.

On opening the bodies, no lesion is perceived throughout

the whole extent of the digestive canal; the left ventricle of the heart contains blood of a brownish red colour, and the lungs are little crepitating, of a tighter texture than usual, and exhibit patches of a dark colour.

Experiment 2nd. If instead of tying the oesophagus after the introduction of the *Cocculus Indicus* into the stomach, they are allowed the power of vomiting, they throw it up almost entire, and sometimes escape death, although they frequently experience two or three attacks similar to those we have described.

Experiment 3rd. A drachm and forty-eight grains of *Cocculus Indicus* finely powdered and mixed with an ounce of water, was applied to the cellular texture of the inside of the thigh of a small dog. At the end of ten minutes, the animal had experienced a convulsive attack similar to that we have been describing (*Experiment 1st*), and died forty minutes after the application of the poisonous substance. He was immediately opened. The heart was no longer contracting, it contained fluid and blackish blood; the lungs appeared wrinkled, and distended with blood; the other organs presented no alteration.

Experiment 4th. If the fruit of the *Menispermum Cocculus* be only grossly bruised, and four or five drachms be introduced into the stomach of dogs of small size, none of the nervous symptoms above enumerated take place, even when the oesophagus has been tied to prevent vomiting: under these last circumstances only, the animals do not die, till after having been in a state of great dejection for four, five, six, or eight days. On opening the body, all the fragments of the *Cocculus Indicus* are found in the stomach, and the texture exhibits no alteration.

Experiment 5th. A small and strong dog was made to swallow twelve grains of *Picrotoxine* not purified. At the end of half an hour, the animal, who as yet had experienced no inconvenience, vomited a small quantity of yellow fluid matter,

and fell into a paroxysm of the most violent kind. The muscles of the face were at first agitated with slight convulsive movements, which in a short time became very violent, so that the animal made horrible grimaces; he walked staggering, and always backwards; the fore-feet resting strongly on the ground, hindered him from falling when he stopped. This state of things continued three minutes; he then fell down on the side; the convulsions became general and shocking; the head and the tail, which were strongly bent back upon the posterior part of the vertebral column, formed an arch with the trunk; the fore paws performed frequent movements, and similar to those of a dog swimming. The eyes, which were red, and starting, were every instant shut by the agitation of the eyelids; the animal shewed no sign of sensibility on the approach of such objects as might have excited it; the tongue was of a livid colour, and surrounded by a great quantity of white and very thick foam. The paroxysm continued twelve minutes, and terminated in a trismus, which was preceded by a grinding of the jaws. During the eight minutes immediately succeeding this paroxysm, the animal exhibited no other phenomena than a state of general insensibility, and an extreme difficulty of breathing. He expired fifty-three minutes after the ingestion of the poisonous substance. The examination of the body discovered no lesion of the digestive canal.

Experiment 6th. Another very strong dog was made to take four grains and a half of *Picrotoxine*, perfectly pure. At the end of a quarter of an hour, the animal vomited a small quantity of yellowish and fluid matter; the vomitings were repeated five times in the course of an hour, without any nervous symptom taking place. The next day, the animal was perfectly well.

Experiment 7th. A grain and half of pure *Picrotoxine*, dissolved in half an ounce of water, were injected into the jugular vein of a small and tolerably strong dog. At the end of a minute, the animal experienced some slight convulsive

movements in the face; the eyes became haggard, and he fell immediately on his side; then the attack became general, and was in every respect similar to that described in Experiment 5th; it continued eight minutes, after which the animal remained tranquil, and expired twenty minutes after the injection. On opening the body, it was perceived that the blood in the left ventricle was of a brown red colour; the lungs were wrinkled, very little crepitating, and exhibited patches of a deep colour.

The same phenomena take place when a drachm of the pure liquor of *Picrotoxine* is injected into the jugular vein.

954. It results from these experiments,

1st. That the *Cocculus Indicus* pulverized is an active poison for dogs;

2nd. That it acts like Camphor on the nervous system, and especially on the brain;

3rd. That it ought not to be considered as an acrid, irritating poison, as *M. Goupil* had supposed it to be;

4th. That the active part of this poison is the *Picrotoxine*;

5th. That when introduced into the stomach, not much divided, its effects are confined to the production of nausea, and some vomiting.

6th. Lastly, that vomiting appears to be the best remedy to oppose to the symptoms which it occasions whilst it still remains in the stomach.

OF POISONOUS MUSHROOMS.

OF THE AGARIC.

Characters of the Genus. The pileus commonly pedunculated, doubled downwards; the laminae are scarcely ever anastomosed with one another, and between them are found the *Gongyli*.

AGARIC WITH INCOMPLETE VOLVA.

Of the *Fausse-Orange* (*Agaricus Muscarius*, Lin., *Agaricus Pseudo-Auruntiacus* of Bulliard.)

Its pileus attains to the diameter of from fourteen to eighteen centimetres ; it is at first convex, and afterwards nearly horizontal ; of a beautiful scarlet colour, deeper in the centre, disposed somewhat in rays near the edge, and spotted over with portions of white skin, which are the remains of the volva ; this volva does not completely cover it at its first appearance, and forms a few scales along its stem ; this last is thick at its base, then cylindrical, full, white, from eight to twelve centimetres in length ; the gills (*Laminæ*) are white, unequal, covered, when young, with a membrane which descends upon the stem, and forms its collar.

ACTION OF THE *AGARICUS MUSCARIUS* ON THE ANIMAL ECONOMY.

Experiment. Three of these Mushrooms, mixed with pastry, were given to a dog of middle size. Three hours after, the animal, who had hitherto experienced no inconvenience, felt a trembling and weakness in the extremities. This state of things continued about four hours, during which time he occasionally uttered complaints ; after which, he fell into a state of stupor ; his breathing was slow and deep, and he uttered from time to time plaintive cries ; at one time, he rolled himself on the ground ; at another, he whirled round, with sudden shiverings, which resembled electrical shocks. This state continued eight or nine hours, without the animal having passed any evacuation. He was made to swallow vinegar, which, far from diminishing the symptoms, aggravated them. Eleven or twelve hours after the appearance of the first symptoms, three grains of the antimoniated tartrate of

potash were given him in two spoonfuls of water, which did not however produce any evacuation. At the end of two hours, a small quantity of olive oil was administered to him; and he vomited, five hours after, a part of the Mushrooms: he afterwards vomited again some portions of Mushroom mixed with whitish mucus, and was completely cured in a few days, by means of a certain quantity of milk.

OBSERVATIONS.

1st. *M. Paulet*, who made the above experiment, relates several cases of poisoning by the *Agaricus Muscarius*. The patients experienced nausea, vomitings, faintings, anxiety, a state of stupor and insensibility, and a sense of stricture in the throat. They had neither gripings nor severe pains. A few grains of emetic tartar were administered to them with warm water; they had evacuations both upwards and downwards, threw up the Mushrooms with some bloody matter, and were slowly restored to health by means of emollient medicines: some few experienced pains of the belly, and were treated by emollient fomentations and opiates.

2nd. Several Soldiers, at the distance of two leagues from Polosk, in Russia, ate some Mushrooms, which are supposed to have been the *Agaricus Muscarius*; four of them, being men of a strong constitution, believed themselves exempt from the bad consequence of them, since the greatest part of their comrades were already labouring under symptoms more or less severe: these obstinately refused to take an emetic. In the evening, the following symptoms made their appearance: anxiety, suffocation, ardent thirst, excessively severe gripings, pulse small and irregular, cold sweats over the whole body, great change in the features; a violet tinge of the tip of the nose and of the nostrils, as well as the lips, general trembling, inflation of the abdomen, evacuations by stool of a very fetid matter. These symptoms went on increasing in violence; the men were conveyed to the hospital. A coldness, and a livid

colour of the extremities, a fatal delirium, and the most severe pains, accompanied them to the last moment of their existence: one of them died a few hours after his reception into the hospital; the other three experienced the same fate, and expired in the course of the night.

Appearances on Dissection. The first exhibited the following phenomena: evacuation of a blackish and greenish frothy matter; abdomen inflated; the stomach and intestines were greatly distended with some extremely fetid gas; their interior surface exhibited marks of inflammation, and some gangrenous points; in several places the mucous membrane of the small intestine was destroyed; the stomach contained a small quantity of a blackish fluid. The second was nearly in the same condition, with this difference only, that the interior of the stomach exhibited a kind of inflammatory congestion near the pylorus; the liver was prodigiously swelled; the gall-bladder filled with thick bile of a dark colour. The third and fourth exhibited the same lesions as the first, but much more decidedly marked; broad gangrenous spots were perceived both in the stomach and intestines, where putrefaction appeared already far advanced." (Inaugural Dissertation of *M. Vadrot*, Paris, 1814, p. 26.)

3rd. *Losel* relates that six men died in consequence of eating of this Agaric. (*Flora Pruss.* p. 88, year 1703.)

4th. The inhabitants of Kamtschatka prepare, from the *Agaricus Muscarius* and the *Epilobium Angustifolium*, a very intoxicating drink, which sometimes excites a fatal delirium, accompanied by despair. The servants, who drink the urine of the persons so intoxicated, likewise feel the effects of this fatal Mushroom. (*KRASCHEMINCKOW, Histoire Naturel du Kamtschatka*, p. 209.)

AGARIC WITH COMPLETE VOLVA.

OF THE BULBOUS AGARIC (*AGARICUS BULBOSUS* OF *BULLIARD*).

It rises to the height of from fifteen to eighteen *centimetres*; when young, it is entirely covered by a *volva*, which splits, remains permanent on the base of the stem, and leaves frequently patches of it adhering to the pileus; the stem is cylindrical, swelled at its base, frequently curved when old; the pileus is more or less convex, but never becomes concave; the gills are numerous, unequal, white, and extend only to within two *millimetres* of the pedicle; they are covered, when young, by a membrane, which is detached from the edge of the pileus, and remains adhering to the top of the stem, in the form of a collar, entire and flattened. The whole plant is of a dirty yellowish white colour, and becomes brown as it grows old; its pileus is sometimes viscid.

OF THE SPRING AGARIC (*AGARICUS BULBOSUS VERNUS* OF *BULLIARD*).

NOTE.—This Mushroom and the preceding answer to some varieties of the *Hemlock Mushroom* described by Paulet.

Characters. When young, it is completely covered by its volva, which bursts at the top, and allows a passage to the Mushroom; the stem is cylindrical, thick, and furnished with a volva at its base, full, from five to seven centimetres long. The pileus is at first convex, then concave, because the edges turn up as they grow old. The gills are unequal, and covered, while young, by a membrane, which extends from the stem to the edge of the pileus: this membrane comes off, and remains on the top of the stem, in the shape of an entire collar. This plant is white, sometimes rather yellowish at the top.

ACTION OF THE HEMLOCK MUSHROOM (ORONGE-CIGÜE) ON THE ANIMAL ECO- NOMY.

Experiment 1st. A strong dog was made to swallow some pastry, containing three drachms of this Mushroom in a state of division. At the end of five hours, the animal fed as usual, and had not experienced any inconvenience. Ten hours after its ingestion, he made some efforts to vomit; his extremities grew weak; he lay down, fell asleep, and died shortly after in convulsions. The stomach and intestinal canal were lined with a thick and yellowish mucus; the folds of the stomach, and the interior of the duodenum, exhibited a few livid spots; the gall-bladder was green.

Experiment 2nd. Two of the green Hemlock Mushrooms hashed and mixed with paste, were administered to a dog. At the end of eleven hours, the animal, who had hitherto exhibited no remarkable phenomenon, vomited. A few hours after, he passed some white fæces, and trembled. He soon after lay down, and experienced some convulsive movements; in this condition he continued for several hours, and was affected with singultus; some sharp pains, from time to time, caused the animal to shiver; at length all the symptoms of apoplexy made their appearance, and he continued, at intervals, to have convulsive movements. He was made to take vinegar at different doses, which roused him a little; but he fell quickly into his former condition. He expired thirty hours after the ingestion of the poison. The digestive canal did not contain a single atom of the Mushroom; the interior of the stomach was spotted with reddish points; the mucous and muscular membranes of the intestines were destroyed; there remained only the serous coat, which presented, throughout its whole extent, spots of a livid red colour, which could be perceived on the outside.

Experiment 3rd. Half an ounce of the juice of the yellowish Hemlock Mushroom was given to a great dog, diluted with a little water. He immediately made violent efforts to vomit, and threw up a part of it. He experienced a real *Cholera Morbus* and convulsions, with a considerable diminution of strength, and died twenty-four hours after the ingestion of the poisonous substance. The interior of the stomach presented likewise several red points.

Experiment 4th. Several dogs were made to swallow the fluid obtained from the distillation of the same juice. They did not experience any bad symptom; but the residue of the distillation, administered even in a small dose, proved fatal to all the dogs who took any of it. Death only took place four and twenty hours after the ingestion of it, and was preceded by the symptoms above described. The animals experienced no bad symptoms during the first ten hours. The interior coat of the stomach was strewed over with small red points: the whole of the intestinal canal was lined with a thick viscid and yellowish matter.

Experiment 5th. The watery extract of this plant produced death in less than four and twenty hours. The same thing occurred from a piece of these Mushrooms dried in an oven. The water in which some of these Mushrooms had been macerated for several hours, being administered to a dog, produced bloody stools and violent pains. The animal however recovered. Some other animals died, after having swallowed the pieces of Mushroom that had been thus treated with water.

Experiment 6th. The ingestion into the stomach of an ounce and half of alcohol, which had been made to digest for several hours over one of these Mushrooms well dried in an oven, and which weighed forty grains, produced death. The residue no longer possessed any poisonous properties, as it was administered to several animals without inconvenience. (PAULET, *Traité des Champignons.*)

OBSERVATIONS.

1st. Guibert, his wife, his daughter, two boys who were strangers, and a servant girl, ate at their dinner some of the yellowish Hemlock Mushroom, prepared with some stewed carp. At three in the morning, Madame Guibert, who had dined entirely off this dish, was awoke by a frightful dream, and some nausea; she threw up without difficulty a part of the dinner, and fell into a state of lethargy, which could only be interrupted by the efforts to vomit. An emetic was given to her; she unloaded her stomach, and felt relieved. She was perfectly restored about three weeks after.

One of the boys, and the girl, who had taken no emetic, died, after having experienced the same symptoms: the other boy, and the servant girl, having received timely assistance, were restored to health in the course of three weeks.

Guibert himself, experienced spontaneously a real *Cholera Morbus*, accompanied by very painful cramps, especially in the feet, with retraction of the limbs. He escaped. None of these persons experienced any fever: all of them, except Guibert, fell into a state of continual stupor.

2nd. Similar symptoms made their appearance in two persons of *Surènes*, and two others of *Melun*, who had eaten the same kind of Mushroom. Three of them, who received no medical assistance, died. The *Gazette de Santé* of the 18th of July, 1777, makes mention of the poisoning of five persons by the yellowish Hemlock Mushroom.

3rd. *Benoit*, his wife, and their child, at six in the evening, ate some of the white Hemlock Mushroom gathered and prepared the same day. The next day, nausea, anxiety, and frequent faintings took place: the father and the child vomited copiously after having taken a strong dose of emetic tartar, some milk, and *theriaca*. The child died on the second day; the father expired a few moments after. A short time before death, he was in a state of extraordinary anxiety and stupor,

the belly was distended, the extremities cold, the pulse small and intermitting; he had frequent faintings, and was all over of a livid colour. The mother, who took no emetic tartar, on account of an uterine hæmorrhage under which she was labouring, had nevertheless vomited considerably on the second day; she was weak, pale, and in a state of great anxiety; her pulse, which had little appearance of fever, was feeble. An ordinary cathartic was prescribed for her, rendered aromatic by orange-flower water. Three hours after, she passed some Mushroom entire, and others, which were dissolved in yellowish mucosities; she felt herself better. She was then made to take some milk of sweet almonds, with a few drops of sulphuric ether, and a little orange-flower water; which gave her considerable relief. The day after, she was again purged, and with success; the hæmorrhage, which had been suppressed, again returned, and the patient experienced from time to time, oppression and faintings. Restorative and antispasmodic medicines were administered to her; but she recovered with great difficulty, and, five or six months after, was still extremely pale, and felt frequent pains of the head and stomach. She died of another disease some time after.

OF THE MOUSE-COLOURED MUSHROOM (*AGARICUS CONICUS* OF PICCO).

955. This Mushroom has been described also by *Micheli*: *Fungus e volva erumpens, pileolo leviter fastigiato, desuper murini coloris, inferne ex albo rufescenti, pediculo albo cylindrico.*

Mushroom projected, of a conical shape, of a gray mouse colour, and looking like satin underneath, with whitish laminae, and a white stem, somewhat crooked, which rises to the height of from four to five inches, bearing a pileus of about one and a half in extent, the internal substance of which on being cut, appears to be composed of small grains of a gray colour,

which, at a little distance, make it appear of an ash colour. Its gills, which are mixed with small pieces of laminæ, are of a clean white colour, with a slight tinge of yellow. The stem, which itself is of a dirty white, is filled with a substance extremely white, and bears at its base the remains of a thin envelope, which covered the Mushroom.

ACTION OF THE MOUSE-COLOURED MUSHROOM ON THE ANIMAL ECONOMY.

OBSERVATIONS.

1st. A woman of Stupinis, her husband, three boys, and a girl, ate, on the 6th of October, at their dinner, two pounds of this Mushroom cooked with butter. About two o'clock in the morning, one of the children, seven years of age, complained of acute pains in the abdomen: some theriaca was administered to him. The mother, who had eaten plentifully of the dish, experienced a moment after, a violent cardialgia, with suffocation, and made great efforts to vomit. The same thing happened to the eldest child. The father also was attacked before day-light; the second son about nine o'clock, and the daughter, who had only eaten a very little, did not begin to complain till towards evening.

On the 7th of October, the child of seven years of age, was in a state of stupidity, suffered greatly in the abdomen, and was only able to take cold water; the belly became inflated; the child at intervals, uttered plaintive cries, very acute, although sunk into a state of complete lethargy. Towards noon, he experienced convulsive movements; the extremities became stiff, the pulse extremely small, and he died during an attack of cynical spasm. His body was covered with violet-coloured spots. The stomach and intestines were distended by a fetid-gas and corroded in their interior surface; near the pylorus were perceived some livid spots; the colon contained some live worms, and the remains of the Mush-

rooms mixed with a yellowish fluid; the liver was extremely bulky, pale coloured, and without consistence.

The mother, who complained of a suffocating anxiety, of cardialgia, with vomitings of a greenish and bloody matter, became yellow over the whole body, and was not able to breathe. The abdomen was in a state of spasmodic constriction; the navel forced in; the slightest pressure increased the retraction of the legs. She took only the theriaca, and died eighteen hours after the invasion of the symptoms, in a state of profound lethargy, and with cold sweats. There issued from the nostrils ichorous blood, and froth from the mouth. The abdominal viscera exhibited lesions similar to those of the preceding subject.

The child of ten years old, who had eaten nothing all day, but a quantity of grapes, was in a state of stupidity in the evening; he experienced the symptoms above described, and died in convulsions. The liver was extremely bulky. On opening the stomach, there issued so infecting a smell, that the examination of the other viscera was given up.

The girl had faintings, vomitings, and tight pains at the stomach; she refused to take an emetic; the pulse became frequent, small, and irregular; a singultus appeared from time to time; she felt a violent and burning cardialgia, anxiety, sensation of strangling, and extreme thirst. She was bled: the blood was black and livid, and she seemed to be somewhat relieved. She soon after, however, experienced suffocation, and a difficulty of swallowing; she was delirious, and had an hæmorrhage from the nose. Manna was administered to her, which procured some evacuations. On the third day, she expired in a lethargic state, amidst the most terrific anguish, shiverings, cold sweats, convulsions, and delirium. The same lesions of texture were observed as in the mother and the child of seven years; the gall-bladder was completely empty, and the part of the liver next the stomach, was soft and livid, whilst this viscus was white on its upper and anterior surfaces.

The eldest of the children experienced nervous colics, with retraction of the legs, cardialgia, frequent vomitings, palpitation of the heart, and a sense of strangling. The emetic tartar, administered in two doses, procured copious evacuations. A white decoction was afterwards given to him, and he was made to take every hour ten drops of the *Liq. Mineral. Hoffmann*, in two ounces of theriacal water, which seemed to relieve him a little; nevertheless, the gripings returned from time to time; he felt head-ache, a kind of heaviness of the stomach, delirium, and great anxiety, which obliged him frequently to change his place; fever came on; his eyes were inflamed. Some blood was taken away, and he obtained some relief. The bleeding was repeated in the evening, and a glyster administered; these means put a stop to the gripings of which he complained, and the fever was diminished. The next day, the tongue appeared loaded; three ounces of manna were prescribed for him, which procured beneficial evacuations. He was still very weak, felt a painful tension of the stomach, had some spittings tinged with blood, and some acid eructations, which were soon relieved by magnesia. The dose of Hoffmann's Liquor was gradually diminished, and the child recovered.

The father, who was sixty years of age, and had been evacuated by means of emetic tartar, had a copious dysentery which lasted till the third day. He remained nearly five days without uttering a word; the eyes fixed, and swimming with tears; the pulse small, slow, and languishing. He recovered by degrees; his digestion was performed without difficulty, and he had frequently bloody evacuations: the case of the eldest son was just the same. Both of them were treated with Peruvian bark, and balsamic syrup. A year after, they felt again the evils which they had suffered. (*Mémoires de la Société Royale de Médecine*, anno 1780, et 1781; Observation of *M. Picco*, p. 355.)

AGARICS WITHOUT A VOLVA.

Laminæ unequal ; stem central ; juice milky, commonly white, though sometimes yellow or red.

OF THE KILLING AGARIC (*AGARICUS NECATOR* OF BULLIARD).

It is of a red colour, bordering on yellow ; its flesh is firm ; as soon as cut into, a milky liquor issues out, which is acrid and caustic ; the stem is cylindrical, full, naked, thick, of the length of ten centimetres, at most : its pileus is at first convex, afterwards flat, then concave in the centre ; it is frequently larger on one side than on the other ; sometimes it is marked with concentric zones ; it does not exceed seven or eight centimetres in diameter ; the surface is covered with hairy patches of a darker colour, which give it a hairy appearance, and disappear with age ; the laminæ are unequal ; the small number of those that are entire, form a sort of tuft at their insertion into the stem. It grows in woods at the latter end of summer.

Bulliard asserts, that a very small quantity of this Mushroom is required to produce the most fatal symptoms. Its juice is believed to produce terrible colics.

OF THE ACRID AGARIC (*AGARICUS ACRIS* OF BULLIARD).

It is white, except the laminæ, which, according to their age, are sometimes yellowish or reddish ; the stem is naked, full, cylindrical, fleshy, from two to three centimetres in length, and almost as much in thickness ; the pileus, at first convex and irregular, becomes afterwards flat, then concave, with the edges winding and undulating ; this pileus is fleshy, about eight or ten centimetres broad ; it exhibits no traces of con-

centric zones; the laminæ are numerous, unequal, frequently bifurcated, running a little down the stem.

OF THE CAUSTIC AGARIC (*AGARICUS PYROGALUS* OF BULLIARD).

Its stem is cylindrical, naked, full, of a yellow, livid, and earthy colour, three or four centimetres in length, and from eight to ten millimetres in thickness; its pileus is at first convex, then almost flat, with a slight depression in the middle, of the same colour as the stem, frequently marked with blackish concentric zones; it attains to a diameter of sixteen centimetres; its laminæ are numerous, somewhat reddish, unequal, adhering a little to the stem. The whole plant, when wounded, yields a milky liquor, sweet when young, and which afterwards becomes acrid and caustic.

OF THE STYPTIC AGARIC (*AGARICUS STYPTICUS* OF BULLIARD).

Its general colour is that of cinnamon, more or less deep; its flesh is very soft, and tears with difficulty; its surface is dry; its stem is naked, full, a continuation of the pileus, somewhat compressed, and goes on expanding to its summit; it is from ten to fifteen millimetres in length; the pileus hemispherical, with the two extremities somewhat prolonged and rounded, and the edges rolled underneath; its great diameter is three centimetres at the most; the laminæ are straight, all of them entire, capable of being detached from the flesh, and remarkable for the manner in which they terminate, all of them at a circular line, beyond which none of them pass.

Paulet asserts, that this agaric, when given to animals, affects them much, and purges them, but does not kill them.

The *Pepper* and *milky Agarics* (*Agaricus Piperatus* et *Agaricus Lactifluus*) are also poisonous.

HISTORY OF SOME OTHER POISONOUS MUSHROOMS.

OF THE CROSS OF MALTA.

“ Small bulbous Mushroom, pursed, stem straight, with a collar, rising to the height of three or four inches, of a pale flesh colour, something like that of veal, and having the pileus divided into five or six equal portions, bearing some sort of resemblance to a Maltese Cross. Its substance resembles more a real animal flesh, than the pulp of a Mushroom, not being covered with any skin, as almost all the other species are. This substance is cool, somewhat moist, of the same colour within as outside, and has the smell of the common Mushroom extremely exalted. The centre of the pileus is marked by a round button, a little elevated, and regularly circumscribed; its lobes are about two lines in thickness; its laminae, which are almost all of equal length, and of the same colour as that of the under part of the pileus, are inserted circularly and radiating to a sort of tuft, without touching the stem. This stem, which is full of marrowy substance at first, empties itself in the end in a great measure, and becomes hollow. The collar and the purse are of a beautiful white.” (PAULET, tom. ii. p. 316.)

M. Paulet ate about the half of one of these Mushrooms: in a short time he experienced a great degree of debility, and lost his senses. Half an hour after, a considerable quantity of vinegar was administered to him, and he recovered the use of his senses; he immediately swallowed some emetic tartar, and vomited the Mushroom; he had nevertheless, for several days, a looseness, weakness of the stomach, and severe gripings.

OF THE RAVEN'S EYE (*FUNGUS MINIMUS
TOTUS NIGER UMBILICATUS* OF VAIL-
LANT).

“Flesh white, tinged a little with the colour of the outside, its laminæ are of a jet black, and shine like that substance, compressed, and tender, of about two lines in height, having in their intervals small portions of laminæ placed by the side of the edges of the pileus, and uniting around the stem without adhering to it. The stem is straight, cylindrical, hollow, from the marrow being exhausted, and about three lines in diameter. It is found in the *Nivernois*.” (PAULET, tom. ii. p. 196.)

OBSERVATION.

“A young vine-dresser, having some bread with a little butter for his afternoon repast, thought proper to cook this Mushroom with his butter, and ate it. A few hours afterwards, he complained of a swelling at the stomach, and very severe pains of the bowels. A great quantity of warm water was given him to drink, with emollient glysters, which afforded no relief. In the middle of the night he was found with the mouth closed, the eyes sparkling, a hideous aspect, and in a state of spasm and immobility similar to a catalepsy. He was bled in the foot, and made to take six drops of the *lilium* of *Paracelsus*, which recovered him a little; but he was extremely ill the whole night. The next day, he was copiously evacuated downwards by means of a strong dose of stibiated tartar, combined with tartrate of potash; but at three in the afternoon, he spit up blood in great abundance, and, a moment after, vomited a portion of the Mushroom, which was black and unaltered. At five, he vomited another portion. The symptoms subsided; nevertheless, the patient experienced a fever, which appeared to be of a putrid nature, and which

continued fourteen days." (*Lettre de M. Varnier, à M. Paullet, op. citat. p. 197, tom. ii.*)

OF THE MEDUSA'S HEAD (*AMANITA FASCICULOSA PILEIS RUFO-FUSCIS* OF DILLEN).

" It grows in a tuft, at the foot of oak-trees, sometimes to the number of thirty, united by their base, at first of a dirty yellow colour, afterwards of a clearer red. It rises to the height of from four to six inches, and bears *pilei* which do not exceed an inch and half in extent. These heads, or *pilei*, which at first have the appearance of brown crusts, especially in the centre, have their laminæ covered at their first appearance with a veil, which is white, thick, firm, giving them a globular form, and which bursts in the end to become converted into a collar; these heads terminate, by assuming the form of a cap. The gills, at first as white as the veil, are intermixed with small portions of laminæ, and adhere strongly to the stem, where they terminate by fine ribs confounding them with its substance, and finish by acquiring a reddish tinge, as does also the veil. The stems, which are swelled out a little from the bottom, are cylindrical, and of four or five lines in diameter, tinged with the colour of the top of the pileus, and full of a filamentous substance." (PAULET, tom. ii. p. 304.)

At six in the evening, a dog of middle size was made to take a certain quantity of this Mushroom; the animal moaned the whole night, and died twelve hours after the ingestion of the poisonous substance. The œsophagus was lined with a white and glairy mucus; the stomach wrinkled and inflamed; the intestinal canal was in the same state; its coats, which were increased about half a line in thickness, were full of a brown liquor, of the same colour as the Mushroom.

OF THE IVORY WHITE.

“ A small Mushroom of a shining white like ivory, surface dry, very pleasing to the sight, which is found in Autumn, especially in the Park of *Saint Maur*. Its laminæ, which are unequal, and finely radiated, end for the most part as if by ribs implanted upon the stem. This stem, which is full, and which may be about two inches high, with three lines of diameter, is neither straight nor cylindrical; it is somewhat flattened, and grooved from the top. The pileus is grooved in the middle, and its edges are accommodated to that form.” (PAULET, tom. ii. p. 153.)

One of these Mushrooms administered to a dog, produced at the end of three hours copious evacuations upwards and downwards; the animal refused food, and appeared greatly dejected.

OF THE REDDISH POINTED MILKY MUSHROOM (*FUNGUS PARVUS PIPERATUS LACTEUM SUCCUM FUNDENS* OF MICHELI).

Pileus, with the centre elevated to an acute point. This point is at length destroyed to make room for a cavity, a thing which generally happens to all the Mushrooms that are acrid and milky. This one is white; but its flesh, which is at first white, reddens with the contact of the air, as does the juice which it gives out when cut, which from the white colour it exhibits at first, becomes shortly of a beautiful carmine red: this juice is acrid and burning. Its laminæ, which are white, and increase in thickness towards their base, are of unequal length. The stem, which is a continuation of the substance of the pileus, is cylindrical, and full of a marrowy substance.

M. Picco having given some of this Mushroom hashed up

with meat to a dog, the animal died of gangrene at the end of twelve hours.

OF THE *EYE OF THE OLIVE-TREE* (*FUNGUS PERNICIOSUS INTENSE AUREUS* OF MICHELI).

It grows in tufts, at the foot of the olive-tree. The colour of the top of the pileus is a deep yellow, and becomes in the end olive; its laminæ are of a dirty or deep yellow. The whole plant assumes nearly the shape of a whip, and has as it were ear-shaped lobes. The colour of its substance partakes of the yellow colour which predominates; its flesh is not firm and brittle, but somewhat soft; its surface is dry, soft to the touch like velvet; its laminæ are elevated, a little separated from one another, and of unequal length. It has no disagreeable taste or smell.

The *green oak-ear* ought also seemingly to be suspected.

OF THE HOLLOW AND POISONOUS FUNNEL (*FUNGUS INFUNDIBULUM REFERENS ALBUS* OF BUXBAUM).

The animals who eat of this Fungus, are incommoded in a very sensible manner; they quickly throw it up by vomiting, and are greatly dejected in consequence of it.

OF THE *GREAT MUSTARD POT*.

A dog was made to take one of these Mushrooms; two hours after, the animal threw it up by vomiting.

Another species of this kind, designated by the name of *Terebinthine*, produced the same effects on another dog.

956. We shall proceed, however, to relate some observations of poisoning resulting from the ingestion of a mixture of two or three species of poisonous Mushrooms,

OBSERVATIONS.

1st. A farmer went on a Sunday to take a walk in a wood near his house, accompanied by his wife, who was three months advanced in pregnancy, and three of his children, aged, one five years and a half, the other four, the third two years: they perceived some Mushrooms of different species; they gathered them without choice, and returning home, served them up and ate them. In the course of the following night, the wife felt some uneasiness, and an oppressive pain in the epigastric region: all of them, during the Monday, experienced a sensation of suffocation, and of cardialgia, and frequent nauseas, which in the father were the same day succeeded by vomitings. On the Tuesday, the symptoms were more severe, with the addition of new ones; continual nauseas, vomiting of bilious matter, respiration more difficult, pains throughout the whole extent of the abdomen, but most sensible in the epigastric region; tenesmus, difficulty of making water. Two of the children died in the course of this night, and the third the next day. From the Wednesday to the Friday evening, the mischief continued to increase in the father and mother; the following symptoms were observed; intolerable pains of the stomach, towards the hypochondria, the loins, and the region of the bladder; inflation of the belly, difficulty in making water increased, tenesmus more painful, glairy and bloody evacuations upwards and downwards; cephalalgia, dry tongue, unquenchable thirst, anguish, convulsive motions of the extremities; in the father, nasal hæmorrhage.

On Friday evening, œdematous swelling of the articulations of the hands and feet in the woman only; in the husband, shiverings preceding gangrene of the intestines.

On the Saturday, the following phenomena: in the husband, chapped lips, aphthæ, inflammatory redness of the tongue and fauces, singultus, syncope, depression and intermission of the pulse, delirium, suppression of urine, and of the alvine ex-

cretion, icy coldness of the extremities, universal cold sweat, death. On the same day, in the wife, convulsive movements were already observed in the extremities. Copious emollient and antispasmodic drinks, and an oily sedative draught, caused her to throw up during the day, several shapeless portions of the Mushrooms. In the evening, the vomiting was less frequent, the urine began to flow, she passed a glutinous and fetid stool, the convulsive movements of the extremities ceased in the course of the night. On the Sunday morning, the gripings were less severe, the inflation of the belly was diminished. Four days after, the symptoms had nearly ceased; there remained a great degree of debility, a swelling of the inferior extremities only, trembling of all the extremities, fixed pain above the right orbit. Her convalescence was tedious; however, three months after, she recovered her flesh, and felt very distinctly the movements of her infant."*

2nd. The wife of a physician tasted inadvertently a piece of dried Mushroom; she chewed it, immediately spit it out, and rinsed her mouth. Half an hour after, she experienced great uneasiness, shiverings, retchings, inclinations to vomit, accompanied with useless efforts, and a very painful sensation of the stomach. Some time after, she was affected with continual vomitings, paleness, cold sweats, the eyes almost resembling those of a dying person, pulse extremely low and small. (*Journal Général de Médecine*, tom. xxvi. p. 265.)

2rd. *M. Dufour*, a physician of *Montargis*, gathered in the neighbouring forest some fresh and wholesome Mushrooms, known (in French) under the common names of *Cepe*, *Columelle*, and *Oronge*: they were stripped of their skin and their stem, cut into slices, and cooked in their juice with butter and fine herbs, under a camp oven: they were served up at table. The servant girl, aged twenty years, who had eaten the greatest quantity, very shortly complained of con-

* *Journal Général de Médecine*, tom. xxv. p. 241.

fusions of the head, giddiness, and a slight heaving of the stomach; her face was red and inflamed, the eyes starting and lively, the pulse large, undulating, and full. The eldest daughter of M. Dufour, aged twelve years, experienced the same symptoms without any nausea. A little child, eighteen months old, that had only eaten some bread dipped in the gravy, slept quietly for sixteen hours, contrary to his usual custom, and exhibited no other remarkable phenomenon. The other child, aged eleven years, complained of confusion of the head, and intoxication: the parents did not experience the least inconvenience, although they had partaken of the same dish. M. Dufour administered to all the patients emetic tartar, plentifully diluted, and endeavoured to excite the evacuations sympathetically, by making all of them vomit into a large earthen vessel. An antispasmodic draught with a large dose of ether was next employed, and the cure was completed by the evening. It appears that these accidents were owing to two Mushrooms of the *Agaricus Muscarius* of Lin. which had been confounded with the proper ones, and entered into the composition of the dish.”*

4th. The same physician was requested to visit a child of nine or ten years old, that had been ill four days, and had been brought out of the forest of Montargis; it was thought to have been poisoned by some Mushrooms. He was in the following condition: deadly paleness; covered with sweat, clammy, and cold as ice; the eyes half open, discovering only the opaque cornea; the pupils immovable, and insensible to the impression of light; stiffness of the whole body, or rather a universal straight tetanus; the abdominal muscles in the utmost state of spasmodic constriction; the belly flattened, and hard as a board; trismus, or invincible spasm of the jaws; the pulse was gone, and the movements of the heart scarcely perceptible. The child might have been supposed

* *Gazette de Santé*, 21st August, 1812.

dead, had not the extremities and thorax been agitated by some convulsive movements. M. Dufour broke two of the fore-teeth with a pair of scissars, and administered, by means of a small tin spoon bent into a spout, a mixture of equal parts of sulphuric ether and orange-flower syrup; the body was enveloped with leaves of tansy, nightshade, dulcamara, and jessamine; frictions were employed on the abdomen, with a mixture of oil of chamomile, camphor, alkohol, and ammonia. Every means were had recourse to in order to restore heat to the patient. Deglutition, which was at first difficult, shortly became free; the child opened his eyes, then the mouth, and was restored in the course of a few hours, after having swallowed an ounce of ether, and as much syrup. It was soon determined that there were among the Mushrooms of the wood, the *Amanita Viridis* of Persoon, the *Hypophyllum Virosium* of Paulet, the *Hemlock-Mushroom*, and other poisonous species. (*Gazette de Santé*, 1st November, 1812.)

5th. *Lemonnier* opened the body of a young person who had been poisoned by Mushrooms. He found the portion of the stomach contiguous to the pylorus inflamed, the duodenum distended with blood; its interior membrane was slightly spotted, and exhibited here and there small excoriations: its inferior part was drawn up. (ALIBERT, op. citat. tom. i. p. 462, 3rd Edition.)

957. Having thus described the facts relating to the poisoning by the different species of Mushrooms, we may give a general description of the symptoms to which they most frequently give rise. An excellent report on this subject has been made to the Society of Medicine of Bourdeaux.

“Pains of the stomach,” says the document, “gripes, nausea, evacuations upwards and downwards, are the first symptoms with which the patients are attacked. Shortly after, heat of the bowels, faintings; the pains become more continued and violent; cramps, convulsions, sometimes general, sometimes

partial, unquenchable thirst, succeed : the pulse is small, hard, tight, and very frequent. When the symptoms, after having lasted a certain time, do not diminish in consequence of the relief afforded, vertigoes, a stupid delirium, and drowsiness, affect some subjects, and are only interrupted by the pains and convulsions. In others, there is no drowsiness ; the pains and convulsions exhaust the strength ; faintings and cold sweats come on ; death puts a period to this series of sufferings, after having been foreseen and announced by the patient himself, who has not lost his senses for a single moment.

“ The poisonous Mushrooms do not manifest their pernicious action till a certain time after they have been eaten ; most commonly from five to seven hours after. Twelve or sixteen sometimes elapse, more rarely four and twenty, before any symptoms are felt. The serious alterations in all the viscera prove, that this poison, having acquired all its energy by the means of digestion, extends itself over the whole animal economy, excites the most violent irritation, and an inflammation which quickly degenerates into gangrene, which takes place with a greater degree of intensity in the digestive passages, which have immediately received the poison, and which preserve the remains of it in a state of solution during a longer time.”*

958. In collecting the different phenomena exhibited in the bodies after death by this kind of poisoning, they may be reduced to the following : “ Violet-coloured spots over the integuments, very extensive and numerous ; abdomen extremely bulky ; the conjunctive as it were injected ; the pupil contracted ; stomach and intestines inflamed, and scattered over with gangrenous spots ; sphacelus in some portions of this viscus ; very strong contractions of the stomach and intestines ; so much so, that, in these latter, the thickened membranes had almost obliterated the canal ; the œsophagus in one of the sub-

* *Rapport du 26 Juin, 1809.*

jects was inflamed and gangrened; in another, there was an intus-susception of the *Ileum* from above downwards, for the space of three inches; one single person had the intestines distended with excrementitious matter. In none have any remains of the Mushroom been found: they had been either completely digested, or evacuated. The lungs were inflamed and distended with black blood; the same congestion had taken place in almost all the veins of the abdominal viscera, in the liver, spleen, and mesentery; inflammatory and gangrenous spots on the membranes of the brain, in its ventricles, on the pleura, lungs, diaphragm, mesentery, bladder, uterus, and even on the foetus of a pregnant woman; the blood in this subject was extremely fluid; in other persons it was almost coagulated; the extreme flexibility of the limbs was not a constant appearance.”*

959. The preceding facts allow us to conclude, that Mushrooms act in a different manner according to the species to which they belong.

Zeviani says, in a dissertation on poisonous Mushrooms, *Il solo veleno dei funghi contiene il se la malizia di tutti, e vari molteplici effetti produce secondo che è in maggior copia ingollato, ed in maggior copia dentro le vene s'intrude.*

INDICATIONS WHICH SHOULD EXCITE A SUSPICION OF MUSHROOMS.

960. All those growing in moist and marshy grounds, in the shade, that is to say in thick forests, where the influence of the solar rays has scarcely any access, ought to be rejected as of very bad quality: the substance of these Mushrooms is softer, less tight, more porous, and contains a great deal of moisture. They have generally an ugly look, and exhibit a surface more or less dirty. *Paulet* observes, that the exist-

* *Rapport, cit. p. 10.*

ence of a glairy coat, which covers the surface of certain species, is no indication of a suspicious quality; but then they ought not to be regarded as good, only when they unite with that state, all the qualities of those which are eatable; for all the Mushrooms with a moist surface, which are dull looking, or which change colour when cut, or which have the virulent smell very strong, or are of a bright colour, or of several distinct colours, especially if they come out of an envelope, and are found in the shade, ought to be rejected as of a bad quality. The same may be said of such as the insects have bitten, and afterwards have quitted. We ought also to regard as pernicious all those which have bulbous and soft stems, or which have fragments of skin glued to their surface. All those must likewise be rejected which grow rapidly, and corrupt very quickly. It has long been an opinion, that Mushrooms when dried, lose their deleterious properties; this fact, which may be true for some of the species enumerated, is not so for the whole, for the agaric preserved with pepper retains its acrimony; beside, we have seen that the wife of a physician was poisoned in consequence of having eaten a piece of dried Mushroom.

ACTION OF ALKOHOL ON THE ANIMAL ECONOMY.

Experiment 1st. Two drachms of Alkohol were introduced into the stomach of a cat. Immediately after, the animal agitated itself violently, then lay down on the side in a state of great insensibility, and without motion; the breathing became laborious and sterterous, and the pulsations of the heart were accelerated. This situation continued eight minutes; then the breathing became less difficult; the animal rose up, and was able to walk about.

Experiment 2nd. An ounce and half of the same fluid was injected into the stomach of a very large rabbit. The

same symptoms followed, and did not disappear till after forty minutes.

Experiment 3rd. The same experiment was repeated upon a rabbit much younger, with seven drachms of the same fluid. At the end of two minutes, the animal was evidently under the influence of the poison, and three minutes after, he lay down on the side in a state of great insensibility, and motionless; the pupils were extremely dilated; from time to time the limbs were agitated with slight convulsive movements; the breathing was performed in a painful manner, and ceased altogether an hour and fifteen minutes after the ingestion of the Alcohol. At the end of two minutes more, the animal appeared to be dead. The thorax was opened, and it was perceived that the heart was contracting with tolerable force and frequency, and that it contained blood of a dark colour. A tube was introduced into the trachea, and some air was blown in: by this means the natural appearance could be preserved to the pulsations of the heart, the same as in an animal from which the head has been removed.

Experiment 4th. Two ounces of the same fluid were injected into the stomach of a rabbit. The injection was scarcely finished, when the animal became insensible. The same symptoms were observed as described in the preceding experiment, and death took place twenty-seven minutes after the introduction of the poisonous substance: on examining the thorax, the heart was found to be contracting. (BRODIE, *Philosoph. Trans.* year 1811, p. 176, 1st Part.)

Experiment 5th. At half past eight in the morning, we introduced into the stomach of a small robust dog six drachms of Alcohol, at 40°: the œsophagus was then tied. Immediately after, the animal appeared to be agitated, he ran over the laboratory in different directions, and did not cease to walk at his ease for ten minutes: he had a wild appearance. At three quarters past eight, he began to experience vertigoes. At ten minutes after nine, he lay down on the side, and was

no longer able to stand. Till this moment he had walked about in different directions, and fell down several times, but rose immediately; his limbs had not been paralyzed. At twenty-five minutes after nine, he uttered plaintive cries, and made some unsuccessful attempts to lift up his head; the limbs were pliable, the pupil contracted; he both heard and saw very well; his muscles were not agitated by any convulsive movement. Ten minutes after, his cries became acute. At forty minutes after nine, he tried to get up on his feet, but fell down again immediately, striking the ground with his head; a few moments after, he made fresh efforts, rose up, walked for a few seconds, and fell down, uttering acute cries. At eleven, he was lying on the side, and continued to suffer; no convulsive movement. He died at half past eleven. He was opened at two. The blood contained in the heart was black and coagulated; the lungs did not exhibit any alteration; the mucous membrane of the stomach was of a cherry-red colour throughout its whole extent, and presented a very great number of longitudinal bands of a blackish red, formed by extravasated blood between the two coats.

Experiment 6th. When eight or ten grains of Alcohol, at 40° , are injected into the cellular texture of the thigh of a dog of middle size, it is observed, that the animal is agitated; for thirty or forty minutes, he walks about in all directions, with a wild aspect, and experiences no giddiness; then the posterior extremities become feeble; his walk becomes staggering; he vomits, at two or three different times, yellowish bilious matter. Fifteen or twenty minutes after, the vertigoes are more violent; the animal walks about as if mad, falls down, gets up again, and continues running over the laboratory. In a short time after, he experiences great difficulty in getting up on his legs, and agitates them as if he were swimming. These efforts soon become fruitless: then he lies down on the side, in a state of great insensibility; the limbs are pliable, and exhibit no convulsive movement; the animal utters no moan,

except when shaken; the breathing is deep; the pupils in their natural state. These symptoms continue during two or three hours, and the animal dies. On opening the body immediately after, no lesion is discovered in the wound; the Alkohol is found completely absorbed; the heart, and the veins of the limb operated upon, contain black coagulated blood; not the least contractions are observed in these organs; the lungs and digestive canal exhibit no alteration.

If the quantity of Alkohol applied to the cellular texture be less, the animals experience those symptoms of excitement which we have mentioned; they labour under slight vertigoes, and quickly recover.

Experiment 7th. We have proved, p. 425, vol. i. part 2nd. that Alkohol produces a sudden death when injected into the jugular vein, and that it acts principally by coagulating the blood.

961. Let us compare with these facts the phenomena produced by spirituous liquors on the human species, when taken in a sufficient quantity to produce intoxication. *M. Garnier*, my pupil, who has sustained an excellent inaugural thesis on this subject, distinguishes three different degrees of intoxication.

The first degree is announced by redness of the face; the eyes become animated, the countenance expands, and exhibits a pleasant cheerfulness and joy; the mind is more free, more lively; the ideas flow more easily, cares disappear, they are replaced by wit, by soft overflowings, and tender declarations of friendship; those under its influence talk much; are indiscreet; their conversation becomes somewhat prolix, and they begin to falter already in their speech.

The second degree of drunkenness is characterized by a noisy turbulent mirth, by immoderate fits of laughter, senseless discourse, obscene songs, brutal actions, according to the peculiar temperament of the individual; by a staggering, uncertain step, similar to that of children; by unnecessary tears,

confusion of the senses, double vision, eyes haggard and melancholy, and *tinnitus* of the ears; the tongue with difficulty articulates sounds; there is sometimes a foaming at the mouth; the judgment becomes false, the reason disappears, the grosser appetites and inclinations are no longer under control: sometimes a furious delirium comes on; the pulse is more expanded; the beating of the carotid arteries more sensible; the face is red and bloated, the veins of the neck distended, respiration hurried; the breath exhales the smell of the liquor. To these are added acrid eructations, inclination to vomit, vertigoes, falls threatening, at length complete: the drowsiness and state of vertigo increase; the countenance becomes pale and cadaverous; the features are sunk in; copious vomitings of acid matter; sometimes involuntary passage of fæces and urine take place, as well as a violent head-ache and total loss of senses; at length a profound sleep, which lasts several hours, during which the perspiration is very copious, puts an end to this painful condition. The functions return by degrees to their original state; the head still continues painful and heavy; the tongue is foul, the mouth clammy; the patient is thirsty, and there remains a loathing of all food, and lassitude of the whole body.

The third degree of drunkenness is a state truly apoplectic: an abolition of the senses and understanding is observed; the countenance is livid or pale; the breathing sterterous; the patient is no longer capable of supporting himself; the mouth is full of foam, coma comes on, and sensation is more or less completely destroyed. This state may continue for three or four days, and terminate in death. *Morgagni* makes mention of a man of advanced age, who remained in a state of intoxication with aphonia during three days, and died on the fourth without having experienced any convulsions.*

962. The preceding facts allow us to conclude,

* *Liber i. Epist. Anat. Med. xix. art. 55.*

1st. That Alkohol exerts the same action on dogs, cats, and rabbits, as on the human species ;

2nd. That it acts with less energy when injected into the cellular texture, than when introduced into the stomach ; but that it is still more active when injected into the jugular vein ;

3rd. That it begins by determining a strong excitement of the brain, to which succeed coma and insensibility ;

4th. That its first effects are the result of the action which it exerts on the nervous extremities, and which is propagated to the brain ; it is however absorbed in the end ;

5th. That there is no identity, as is pretended, between its action, and that of opium. In fact, *A.* Opium acts after being absorbed ; therefore it is much more active when injected into the cellular texture of the thigh, than when introduced into the stomach, because, in the first instance, the absorption is more energetic ; Alkohol, on the contrary, acting on the nervous extremities, must necessarily produce phenomena more rapid and intense in the stomach, than when applied to the thigh. *B.* Alkohol constantly produces, on men and on dogs, an excitement, the duration of which is various, and which is followed by a state of coma and great insensibility ; opium, on the contrary, begins by producing a drowsiness, always accompanied by paralysis of the posterior extremities, and which is quickly followed by convulsive phenomena of the most horrible kind, so that the animals in the end are in a state of real excitement. *C.* Opium does not inflame the texture of the stomach ; Alkohol, on the contrary, produces there a considerable degree of phlogosis.

We may be convinced of the difference which exists between these two poisons, by injecting into the cellular texture of the inside of the thigh of two dogs, of about the same degree of strength, thirty-three, or thirty-six grains of the watery extract of opium, dissolved in two or three drachms of water, and ten or twelve drachms of Alkohol at 40° ; these doses will produce death in the course of about four or five hours.

963. *M. Brodie* is likewise of opinion, that Alcohol is not absorbed, and that it acts sympathetically on the brain by means of the nerves of the stomach. The following are the facts on which he rests this assertion. 1st. The animals which die after having taken Alcohol, exhibit a decided inflammation of the stomach; 2nd. The effects produced by this fluid are so instantaneous, that it appears impossible that absorption can have had time to effect it; 3rd. A person intoxicated is frequently restored by vomiting; 4th. When Alcohol is introduced into the stomach, combined with tincture of rhubarb, and the urine is examined after death, the tincture cannot be perceived; whilst, on the other hand, when this latter is absorbed and carried into the circulation, it may be found in the urine, by adding to it a little potash, as has been proved by *M. M. Home* and *Brande*.

M. Brodie compares the action exerted by Alcohol on the brain, to that produced by the concussion or compression of that organ. In fact, these mechanical injuries induce a loss of movement, insensibility, dilatation of the pupils; the breathing becomes difficult and sterterous, ceases altogether, and the patient dies. (*Paper before quoted*, p. 182.)

OF SULPHURIC ETHER.

Experiment 1st. At eight in the morning, half an ounce of sulphuric Ether was introduced into the stomach of a small robust dog, and the œsophagus was tied. Two minutes after, the animal made efforts to vomit, which were renewed a few moments after. At the expiration of five minutes, he experienced vertigoes, which in a short time became very violent. At ten minutes after eight, he was no longer able to stand; all the muscles appeared to have lost their contractile force; he exhibited no convulsive movement, and the organs of sense possessed their full powers; from time to time, he rested his head upon the ground, and made fruitless efforts to

raise it up; the breathing was difficult and accelerated. At sixteen minutes after eight, he uttered plaintive cries, and attempted again to vomit. A few moments after, he ceased to moan, and fell into a state of great insensibility; his limbs were extremely pliable. At forty-five minutes after eight, he began to moan again, and seemed much less drowsy; he turned himself in different directions in order to get up, but could not accomplish it in less than five minutes; his posterior extremities were not paralyzed, but he was troubled with a giddiness, which caused him to stagger; the breathing continued to be difficult and accelerated. At nine, he fell down again, and sunk into a state of great insensibility. He died at eleven. At half past twelve he was opened. The stomach contained a small quantity of a viscid brownish fluid; its mucous membrane presented, throughout its whole extent, a blackish red colour; it was strongly inflamed; the other coats of this viscus were of a bright red; the interior membrane of the duodenum was somewhat inflamed: the rest of the digestive canal was sound; the blood contained in the heart was black, and partly fluid, partly coagulated; the lungs were distended with fluid blood.

Experiment 2nd. At eight in the morning, three drachms and a half of sulphuric Ether were injected into the cellular texture of the inside of the thigh of a small weak dog. At nine, the animal had not presented any remarkable phenomenon. At eight in the evening, he uttered plaintive cries, which were frequently repeated during the night; he staggered in walking. The next day, he was somewhat dejected. This state continued till the end of the fourth day, when he died.

OF CARBONIC ACID GAS.

964. Carbonic Acid Gas is invisible, endued with a taste slightly acidulous, and a pungent smell; its specific gravity is, as 1,5196; it quenches bodies in a state of combustion,

reddens the infusion of tournesol, dissolves in water, and gives a white precipitate with the waters of lime, barytes, and strontian. It is found in the atmospheric air, and in certain grottoes in volcanic countries; it is disengaged from lime-kilns, and from vessels containing liquors in a state of fermentation.

ACTION OF CARBONIC ACID GAS ON THE ANIMAL ECONOMY.

965. The experiments made by *M. Hallé* prove, that animals are brought into a state of asphyxia by this gas, in the space of two minutes.

“ In the month of April, 1806, a family of seven persons were reduced to a state of asphyxia at Marseilles, outside the *Barrière Saint Victor*, by the vapour of a charcoal-stove, which they were burning clandestinely in the yard of the house, the vapour introducing itself by the door and windows. Of these seven persons, five died, and two were saved: they all endeavoured to escape death, by deserting the house; and as it was in the night that the accident happened, they were found upon the stairs, and at the threshold of the door, having a lamp with them, and in the attitude of flight: but the deleterious gas had deprived them of the strength and the means.” (*FODERE, Médecine Légale*, tom. iv. p. 37.)

The same author mentions, having seen waters impregnated with Carbonic Acid Gas produce giddiness, and dimness of sight.

The alterations discoverable by dissection of bodies killed by this gas, are the same as those produced by the gaseous oxyde of carbon, except that the blood is not so black.

M. Nysten has proved, 1st. That it may be injected in tolerable quantities into the venous system, without stopping the circulation; that it does not act primitively upon the brain; and that when a much greater quantity is injected than the blood is capable of dissolving, it produces a distension of this

organ, and death; 2nd. That when injected with caution, it produces only a muscular debility, which ceases in a few days; 3rd. That it may be injected in a stronger dose without producing any pulmonary lesion; 4th. That it turns the arterial blood brown, but in a less degree than the gaseous oxyde of carbon; 5th. That it may be injected in small quantity into the carotid artery, without producing any notable symptom; that when injected in greater quantity, it produces apoplexy, which appears to be owing to the distension beyond measure of the capillary system of the cerebral pulp; 6th. That it ought not to be regarded as deleterious *per se*.

OF THE GASES WHICH ARE DISENGAGED DURING THE COMBUSTION OF CHARCOAL.

966. These gases may be considered as formed of a great quantity of Gaseous Oxyde of Carbon, and a little Carbonated Hydrogen Gas. It is evident, that they only contain some particles of Carbonic Acid Gas; for this latter is decomposed by the red hot charcoal, and converted into Gaseous Oxyde of Carbon.

Characters of the Gaseous Oxyde of Carbon. It is invisible, transparent, elastic, insipid, producing no action on the infusion of tournesol, and lighter than atmospheric air; its specific gravity is, as 0,96783. When a lighted taper is applied to the mouth of a bell filled with this gas, and exposed to the atmospheric air, it absorbs its oxygen, burns with a blue flame, and becomes changed into Carbonic Acid Gas; in like manner lime-water, being poured into the bell after the combustion, becomes turbid, and carbonate of lime is precipitated. When mixed with equal parts of *Gaseous Chlorine*, and exposed to the sun, it becomes converted into a gaseous product, discovered by *M. John Davy*, the specific gravity of which is, as 3,4269, and which strongly reddens the infusion of tournesol. The Gaseous Oxyde of Carbon is

not sensibly soluble in water. It is composed of forty-three parts of carbon, and fifty-seven of oxygen.

967. It results from the experiments made by *M. Nysten* upon dogs, 1st. That the Gaseous Oxyde of Carbon produces, by its mechanical action, when injected into the veins, much more disturbance, *cæteris paribus*, in the circulation and respiration than the Carbonic Acid; that the pains which it occasions appear to be disproportioned to those which a body, whose action depended only on its gaseous form, such as the atmospheric air, would give rise to: which induces a belief, that it possesses a peculiar influence over the nervous system; 2nd. That it acts more particularly, when respired, by opposing an obstacle to the chemical phenomena of respiration, and that it ought not to be regarded as deleterious *per se*; 3rd. That it turns the arterial blood very brown; 4th. That after the cessation of the symptoms resulting from its mechanical action, it leaves behind a disturbance in the functions of animal life, which appears to be dangerous, but which speedily subsides; 5th. That it may be injected in a tolerably strong dose without producing any pulmonary lesions.

The experiments of *M. Nysten* on the *Carbonated Hydrogen Gas* prove, 1st. That when injected into the veins in sufficient quantity to produce distension of the heart, it occasions death, in a manner purely mechanical; 2nd. That it gives rise to no pulmonary lesion; 3rd. That it imparts a little brown colour to the arterial blood; 4th. That when respired, it occasions death, by obstructing the chemical phenomena of respiration, and, consequently, that it is not deleterious *per se*.

968. After having examined singly the gases which are disengaged during the combustion of charcoal, we may proceed to detail the principal phenomena observed in persons asphyxied by the vapours of this combustible body. The general symptoms of this species of poisoning are, a great heaviness of the head, intolerable *Tinnitus Aurium*, disturbed vision, a great propensity to sleep, diminution of strength, and falling down;

sometimes an inexpressible pleasure, which induces the person to remain exposed to this destructive vapour ;* at other times violent head-aches, a great difficulty of breathing, which becomes sterterous ; violent palpitations of the heart, which are shortly followed by a suspension of the respiration, circulation, voluntary movements, and the functions of the organs of sense, a profound coma, and state of apparent death, in which condition the limbs are sometimes flexible, at other times stiff and bent ; the heat is the same as before the accident, and continues a long time in that state ; the countenance is sometimes red and livid, its blood-vessels are very much swelled ; at other times it is pale, and of a lead colour ; sometimes, also the sphincters become relaxed, whence results an involuntary discharge of urine and fæces. The temperament of the person asphyxied has great influence in determining this or that symptom.

969. The dead bodies of such as have fallen victims to this kind of poisoning, preserve for a long time their heat ; the lips are vermillion, and their limbs extremely flexible : the veins, especially those of the lungs and brain, are distended with black fluid blood, which flows with very great facility ; the arteries are nearly empty ; the face is bloated, and more red than ordinary ; the rest of the body is likewise somewhat swelled, and frequently exhibits violet-coloured spots ; the eyes are lively and shining ; the membranes are reddish, and exhibit sometimes small *ecchymoses* ; the lungs are, as it were emphysematous, the muscles softened, the stomach and in-

* *M. Favre* says, in a pamphlet entitled : *Instructions sur les Moyens à employer pour rappeler à la Vie les Personnes Asphyxiées*, printed at Brussels, in 1806 : “ *M. Terrade* has seen a man, who had been asphyxied by the vapour of charcoal, while sealing some bottles in his cellar, and whom he had recalled to life. This person assured him, that he felt his strength diminish by degrees ; that the pleasure which he experienced had forced him in some measure to remain exposed to the action of the deleterious gases resulting from the combustion of charcoal, and that at the last he fell asleep.” page 11.

testines reddish, the tongue tumefied; the epiglottis is always elevated.

OF SPURRED RYE (*SECALE CORNUTUM*).

970. The spikes of certain grasses exhibit sometimes a vegetable production in the shape of a spur or horn, which bears the French name of *Ergot*, and which is most commonly seen on rye.

“The *Ergot*,” says *M. Tessier*, “is a grain commonly curved and elongated, it protrudes greatly beyond the glume which serves for its calyx. Its two extremities, which are of less circumference than the middle part, are sometimes obtuse, sometimes pointed. It is very rarely rounded throughout its whole length, more frequently there are found three sharp pointed angles, and longitudinal lines extending from one end to the other. In many of the grains thus affected are seen small cavities, which might be taken for the bites of insects. The colour of the *Ergot* is not black, but violet, with different degrees of intensity. On the greatest number of the grains in question, are observed some whitish traces at one of the extremities; this is where the *Ergot* was adhering to the glume. The violet coloured bark of these grains covers a substance of a dirty white colour, and firm consistence, from which it is not separated even after long boiling. The grains thus affected easily burst, and they break clean, with a little noise like a dry almond. In the state of grain, the *Ergot* only possesses a disagreeable smell when fresh, or collected in great quantity; but if it be reduced to powder, this smell is more sensibly diffused: it then impresses upon the tongue a taste slightly pungent, and bordering on that of rotten corn. The *Ergot* cannot be confounded either with the carbuncle or the caries.” *M. Tessier* is of opinion, that this disease of the rye depends on the poverty and the humidity of the soil, and probably on the influence of abundant rains.

(*Mémoire sur les Observations faites en Sologne par M. Tessier, en 1777.*) Read is of opinion, that the *Ergot* proceeds from the circumstance of the grain of the rye having been pierced, at the first moment of its appearance, by a species of butterfly, which has deposited in it a liquor capable of exciting a fermentation.*

ACTION OF THE SPURRED RYE UPON THE ANIMAL ECONOMY.

971. It has been remarked, that many persons who had eaten a small quantity of Rye in this state, experienced nervous symptoms, whilst those who had made use of it for a long time, or who had eaten a great quantity at once, were seized with a gangrenous affection. To these two diseases have been given the French names of *Ergotisme Convulsif*, and *Ergotisme Gangreneux*.

Ergotisme Convulsif. It is a well known fact, that the use of Rye in this state has given rise to epidemic diseases, which have laid waste certain cantons of Silesia, Prussia, Bohemia, Hesse, Lusatia, Saxony, and Sweden. Several authors of respectability having given descriptions of the symptoms most generally observed in these epidemics, we shall here extract what is most important to be known. *I. A. Srine*, who has described the effects produced by this poison in 1736, in the country of Wartemberg in Bohemia, says: "the disease begins with an uneasy sensation about the feet, which is a kind of tickling or formication; in a short time a severe cardialgia succeeds; the hands and head are soon after affected. The fingers beside are seized with so strong a contraction, that the most powerful man can scarcely master them, and the articulations appear to be luxated. The patients utter acute cries, and are devoured by a fire which burns their hands and feet. After the pains, the head feels heavy, the

* READ, *Traité du Siegle Ergoté*, in 12mo. Strasburg, 1771.

patient experiences giddiness, and the eyes become obscured by a thick mist, to such a degree, that some persons become blind, or see all objects double; the intellectual faculties are perverted; mania, melancholy, or coma take place, the giddiness increases, and the patient appears intoxicated. This mischief is accompanied with opisthotonos; the mouth is filled with foam almost bloody, or else yellow or green. The tongue is often lacerated by the violence of the convulsions: it swells sometimes to such a degree as to intercept the voice, and produce a copious secretion of saliva. Almost all those, who have been subject to epileptic symptoms, died; those, who after the formication of the limbs, become cold and stiff, have much less distension of the hands and feet. To these symptoms succeed a canine hunger, and it rarely occurs that the patients have any aversion to food. Out of five hundred persons attacked with this disease, only one had buboes in the neck, which furnished a yellow matter, and this patient was a prey to excruciating and burning pains. Another had the feet covered with spots like flea-bites, which did not disappear till after eight weeks. The faces of several of them were covered with this eruption. The pulse was the same as in health. To the spasms succeeded stiffness of the limbs. This disease continued two, four, eight, sometimes even twelve weeks, with some intervals of rest. Out of five hundred persons, three hundred children died." (*Saty. Medicor.* Siles. Specim. iii.)

Ergotisme Gangreneux. *Salerne* gave a small male pig, which had been already castrated, some barley, in which there was one third of *Ergot*. At the end of fifteen days, the legs of the animal became red, discharged a greenish and fetid humour; the under part of the belly and the back were of a black colour; the excretions were in their natural state. This kind of food was continued for a fortnight longer: then some pure bran boiled and still hot, was given to him. The animal at first appeared better; but he soon began again to

complain ; he could with difficulty support himself, and died, still preserving his appetite. The mesentery, jejunum, and ileum, were inflamed ; the edge of the liver exhibited two livid spots ; there were under the throat, and on the legs, some black pimples, which were a little open, and discharged a reddish humour ; there was no gangrene in the feet. Other experiments made by the same author, by *Read*, and by *Tessier*, presented the same results : the animals died with signs of gangrene in the tail, ears, feet, &c. ; and gangrenous spots were found in the liver and intestines.

The human species has likewise been attacked by this disease. Several authors have given detailed accounts of gangrenous epidemics, the cause of which was known to be ergotted rye, and the same symptoms have constantly been observed, as we have already described in speaking of animals.

Darnel, or *Rye-Grass*. (*Lolium Temulentum*.) 1st. *Seeger* gave to a dog three ounces of broth made with the flour of *Darnel Grass* and water. Five hours after, the animal experienced very violent tremblings, which lasted three hours ; he was no longer able to walk ; his eyes were fixed ; his breathing difficult. Nine hours after the ingestion of the fluid, he was in a deep sleep, and insensible ; nevertheless, the next day he was recovered. Other animals submitted to the same experiment, had violent vomitings and convulsions ; the perspiration and urine were increased.

2nd. Two peasants, their wives, and an old woman, ate together five pounds of oat-bread mixed with *Darnel*. Two hours after, they all complained of a heaviness of the head, accompanied with a pain, which appeared principally confined to the forehead. They experienced giddiness and *Tinnitus Aurium*, so that they thought to hear a continual noise of drums and kettle-drums : the tongue exhibited a very strong trembling : they could not swallow, nor pronounce one word distinctly : their breathing was impeded, the stomach very painful. They threw up a quantity of clear water, after hav-

ing made useless efforts to vomit. They had no appetite. They had frequently strong desires to make water, without, however, feeling any pain or other inconvenience from it: their whole body was trembling, covered with a cold sweat, and exhausted by lassitude. They fell, a few hours afterwards, into a state of somnolency. (SEGER, Latin Dissertation on Darnel, *Tubingæ*, 1710.) According to this author, one of the most certain signs of poisoning by this plant, is a general trembling of the whole body.

Wheat. It sometimes happens that the farinaceous part of wheat becomes converted into a black powder, which imparts bad qualities to the bread. *M. Fodéré* affirms, that he has seen, in 1808, colics and diarrhœas, which arose from this cause. The blighted grains may also give rise to accidents.

Hippomane Mancinella (the Manchineel Tree). 1st. A Soldier of Piedmont, taken prisoner at the siege of Belgrade, was carried away a slave into Turkey. He perceived one day on the ground, whilst walking by the sea-side, a number of fruits, which he took for apples: he ate about two dozen of them, returned home after having filled his pockets, and still continued to eat them. An hour after, his belly swelled greatly, and he felt an extreme degree of heat in the intestines. He could no longer stand. These symptoms went on increasing; the lips were ulcerated by the milky juice of the fruit, and he experienced cold sweats. He was made to take in great abundance a watery decoction of the leaves of a species of *Ricinus* (*Avellana Purgatrix*); he vomited, and was purged for four hours. These distressing symptoms disappeared by degrees. They then gave him rice, and he became easy to that degree, that, twenty hours after, he felt no more pain, and the bulk of the belly was remarkably diminished.*

2nd. The same author adds, that the savages poison their arrows with the juice of the Manchineel, which renders their

* *Philosophical Transactions, singular Observation, &c. by Peyssonnel, anno 1758, p. 772.*

wounds mortal : that the rain which falls from the leaves and branches, raises blisters like boiling oil ; that the shade of the tree causes those to swell who repose under it ; (this fact is called in question by Jacquin). He says, that a woman with child was mad enough to eat three of these apples, which did her very little harm : this was looked upon as a miracle, and a proof of the surprizing effects of the imagination on pregnant women.

3rd. The missionaries who have written on the Natural History of America, assert that the malignant vapour which exhales from the Manchineel Tree when cut, kills the workmen who attempt to work at it. *M. Castera* was witness, that a negro had his hands and face swelled and burned in consequence of having cleft a small branch of it. (FODERE, tom. iv. p. 38.)

Mercurialis Perennis. (Mountain Mercury.) This plant is hurtful to sheep and to the human species. It has produced, in different persons who have eaten it, violent vomitings, excessive diarrhœa, a burning heat in the head, profound sleep, and convulsions, which, in one instance, were followed soon after by death. (VICAT, op. citat. p. 215.) *Hans Sloane* asserts, that it possesses a narcotic and fatal malignity. *Bomare* is of opinion, that it produces effects similar to those of the *Palma Christi*.

Chærophyllum Sylvestre. (Wild Chervil.) It is said that the root of this plant, gathered in winter, has produced delirium, a very profound sleep, numbness, and suffocation, which however have not been followed by death. It is asserted also, that the seeds and root of the *Chærophyllum Bulbosum* have excited vertigoes and pains of the head. *Plenck* affirms, that he has often eaten it without any inconvenience. (Op. citat. p. 126.) The *Chærophyllum Temulentum* appears also to produce intoxication.

Sium Latifolium. *Beyerstern* assures us, that the root of this plant, gathered in the month of August, has produced

furious delirium in children and cattle. Some of them have even died of it. It does not appear hurtful when eaten before the middle of the summer. The leaves are not mischievous.

Coriaria Myrtifolia. *Sauvages* relates, that a child, ten years of age, and a labourer, forty years old, died amidst the most horrible convulsions, half an hour after having eaten some of the berries of this plant. (*Histoire de l'Académie Royale des Sciences*, 1739, p. 473.)

OF THE EFFECTS OF ODORIFEROUS PLANTS ON THE ANIMAL ECONOMY.

972. Amongst the plants which we have hitherto spoken of, there are a great number, the flowers of which, more particularly, diffuse a smell which seems to depend on the volatilization of an essential oil, which has sometimes produced fatal accidents. We do not conceive that this odour ought to be considered as an absolute poison, that is to say, as capable of poisoning all persons under all possible circumstances, but only as a relative poison, the effects of which depend on the greater or less nervous susceptibility, and on idiosyncrasy. How many persons do we see, who sleep with impunity in small and close rooms, where are several pots filled with odoriferous flowers; whilst others cannot remain there a few minutes without experiencing symptoms more or less grievous? We shall relate succinctly the principal accidents occasioned by the emanation of these odoriferous plants.

1st. Madame N, forty-six years of age, of a strong constitution, is not capable of remaining in any place where a decoction of linseed is preparing, without experiencing, a few minutes after, a considerable tumefaction of the face, followed by the loss of the intellectual faculties, and syncope. We have been eye-witness of this surprising fact, and have seen the same thing repeated in the person of this lady by the adminis-

tration of glysters prepared with those seeds. The tumefaction of the face does not subside till after four and twenty hours.

2nd. *M. Vincent*, a celebrated painter of this capital, cannot remain in any room where there are roses, without being in a short time attacked with violent cephalalgia, succeeded by fainting. *Marrigues* thus expresses himself in the *Journal de Physique* (year 1780): "I have known a surgeon who could not smell at a rose without experiencing at the moment a singular suffocation, which subsided as soon as the rose was removed from him; and a young lady who lost her voice whenever a nosegay of odoriferous flowers were applied to her nose." *Ledelius* speaks of a merchant, in whom the smell of roses occasioned an ophthalmia.*

3rd. *M. Valtain* relates, that an officer experienced convulsions, and lost his senses, in consequence of having left in his room a certain quantity of pinks which he was very fond of. The basket filled with these flowers was removed immediately, and the windows opened. In the course of half an hour, the convulsions ceased, and the patient recovered his speech. From that time, the officer was never able, for twelve years after, to inhale the smell of pinks, without falling into a syncope.†

4th. *Valmont de Bomare* affirms, that the subtle and odoriferous parts of the betony in flower are so strong, that it is certain that the gardeners who gather this plant become intoxicated, and stagger as if they had been drinking wine.‡

5th. *Boyle* affirms, that if any one repose under the shade of a walnut or elder-tree, they would speedily fall asleep, and experience a severe head-ache.§

6th. Madlle. J. D. aged twenty-four years, was sitting at

* *Ephem. Nat. Cur. Dec. ii. an. 2, Obs. xc.*

† Prize of the Academy, *Hygiène Chirurgicale*, p. 26.

‡ *Dictionnaire d'Histoire Naturelle.*

§ *BOYLE, De Nat. Determ. Effluv. in 4to. p. 33.*

her window, and complained of a violent head-ache. All at once the extensores muscles contracted, she became stiff, and fell backwards, giving a loud scream. Every assistance was instantly given to her, and she soon recovered. *M. Barthelmy*, the author of this observation, having discovered that for some time past the patient had kept shut up in her room, roses, lilies, pinks, and honeysuckles, obliged her to renounce this practice, and she was no more incommoded: excepting once after she experienced slight constrictions in consequence of having worn in her belt a nosegay of honeysuckles; but the removal of the nosegay instantly caused them to disappear. (Inaugural Dissertation, maintained at Paris in 1812, No. 158.)

8th. *Sennertus* and *Boyle* have witnessed purgative effects produced by the smell exhaled from black hellebore and colocynth while pounding them.* The white hellebore has occasioned vomitings in those who gathered it.†

The Emperor Henry IV., a Prince of Savoy, Pope Clement VII., and some other personages, have been poisoned, according to the report of history, by perfumed gloves, or by the vapours exhaled from certain torches.‡

973. We could here relate a very great number of observations similar to the preceding: it shall however suffice us to say, that in general the following symptoms have been observed: numbness, palpitations, syncope, convulsions, cephalalgia, aphonia, several other nervous symptoms, and at last asphyxia.

SYMPTOMS PRODUCED BY THE NARCOTICO-ACRID POISONS.

974. The greatest number of poisonous substances of this

* *Encycloped*, l. c. p. 402.

† *Amœnitates Academicæ*, p. 200.

‡ *AMBROISE PARE*, liv. xxi. chap. x.

class produce a series of remarkable symptoms, which are the same, whether they be introduced into the digestive passages, applied to the cellular texture, or injected into the veins. This character, rarely found in the poisons of the three first classes, exists, as we have already said, in those of the fourth. (*Vide* tom. ii. part i. p. 170.)

975. These symptoms may be reduced to the following: agitation, pain, acute cries, sometimes stupor, insensibility, convulsive movements of the muscles of the face, jaws, and extremities; the head frequently reflected upon the back, vertigoes, falling down, sometimes extreme stiffness of the limbs, accompanied by a general contraction of the muscles of the thorax, which prevents its motion; the eyes red, starting out of their sockets; insensibility to external impressions; pupils frequently dilated; organs of hearing scarcely, or not at all, susceptible of impression; mouth full of foam; tongue and gums livid; nausea, vomitings, frequent stools; pulse strong, frequent, regular or small, slow and irregular; lastly death, which is very speedy when the poison has been injected into the veins; it takes place later when it has been applied to the cellular texture; and generally later still, when it has been introduced into the stomach. We are far from wishing it to be thought that all these symptoms are produced by the same poisonous substance; we only affirm, that they may be observed in administering the different poisons of this class.

LESIONS OF TEXTURE PRODUCED BY THE NARCOTICO-ACRID POISONS.

1. Several of these poisons exert a local irritation capable of exciting a severe inflammation, which may terminate in gangrene. There are others, whose local action is much less; and lastly, some of them remain a long time in contact with the organic texture without producing the least rubefaction.

2nd. The lungs, blood, brain, membranes, and other organs,

present, in general, the alterations which we have detailed under the article *Narcotics* (tom. ii. part i. p. 171).

GENERAL ACTION OF THE NARCOTICO-ACRID POISONS ON THE ANIMAL ECONOMY.

976. 1st. Some of these poisons are rapidly absorbed, carried into the circulation, and act by exciting the spinal marrow: those animals that experience their effects are in possession of nearly all their intellectual faculties; but the contraction of the muscles is such, that the thorax becomes immovable, asphyxia takes place, and death is produced without the least trace of redness being discovered in the digestive canal. The *Upas-Tieuté*, the bean of Saint Ignatius, *Nux Vomica*, the *Angustura Pseudo-Ferruginæa*, are of this description. It is easy to perceive how improperly the denomination of *Narcotico-Acid Poisons* is applied to these substances.

2nd. There are some of these poisons which are likewise absorbed, and which produce a strong excitement of the brain and of the whole nervous system, to which succeeds somnolency: in that case, there is loss of the intellectual faculties, and the animals die of asphyxia, produced by the immobility of the thorax. Inflammation in the texture of the digestive canal is rarely discovered; camphor, the *Cocculus Indicus*, *Picrotoxine*, and the *Upas-Antiar*, are of this kind. Certainly, the denomination of *Narcotico-Acid poisons* is no more suitable to these, than to the preceding articles.

3rd. Some of the poisons of this class are absorbed, act on the brain or on some other parts of the nervous system, produce phenomena of excitement and lethargy, of which the animals die. They produce beside a local irritation more or less intense, which ought not to be considered as the principal cause of death: the *Belladonna*, tobacco, *Datura Stramonium*, the different species of hemlock, &c. are of this kind.

4th. Lastly, it appears, that a small number of these poisons instantly destroy life by acting on the nervous extremities : at least it is difficult to conceive that absorption can take place in so short a time : such are the oil of bitter almonds, the empyreumatic oil of tobacco, alcohol, &c.

TREATMENT OF POISONING BY THE NARCOTICO-ACRID POISONS.

977. The numerous experiments which we have hitherto made to discover an antidote to the different poisons of this class have been in vain ; and we think we may affirm, that *in the present state of science, no substance is known which has the power of decomposing these poisons, and of converting them into a body incapable of exerting a baneful action when not vomited.* We are therefore reduced to the necessity of pointing out such means as are proper for diminishing, or putting a period to the symptoms to which they give rise.

978. The effects produced by the *Belladonna*, *Datura Stramonium*, tobacco, *Digitalis Purpurea*, *Anagallis Arvensis*, *Aristolochia Clematitis*, the different species of *Cicuta*, the *Nerium Oleander* and *Rue*, we are of opinion ought to be treated according to the following precepts :

1st. If the poison has been swallowed only a short time, and has not produced copious vomitings, an evacuant should be administered, composed of two or three grains of antimoniated tartrate of potash, and of twenty or four and twenty grains of ipecacuanha, dissolved in a small quantity of water ; by these means the expulsion of them will be facilitated, and there will be no fear of hastening their absorption, provided that the quantity of fluid in which the emetic has been dissolved is not considerable. The vomiting may be assisted by tickling the throat with a feather.

2nd. If the poison has been some time ingested, and there be reason to suspect that it has already passed into the intes-

tinal canal, an emetic combined with a cathartic should be administered, composed of two or three grains of emetic tartar, and an ounce, or an ounce and half of sulphate of soda. Purgative glysters ought also to be administered.

3rd. If by these means the poisonous substance should be ejected, and the patient should exhibit symptoms of a cerebral congestion, we should not hesitate to have recourse to blood-letting, which it is preferable to effect from the jugular vein, and which should be repeated according to the temperament of the patient, and the advantages it may have procured. This method has in no case appeared to us to be hurtful, and we have frequently derived from it good effects. This should also be had recourse to in those cases where the administration of evacuants has been followed by no good effect, and there is present a congestion of the brain.

4th. Acidulated drinks should afterwards be employed, and especially vinegar and water, which should be exhibited in small doses, frequently repeated. This remedy has appeared to us to be particularly serviceable when much diluted, and administered immediately after the expulsion of the poisonous substance. In fact, if it were a little concentrated, it would add to the irritation produced by all of these poisons, and increase the inflammation of the texture of the digestive canal. It is probably for the same reason that it has appeared to us of little efficacy twenty, twenty-five, or thirty hours after the poisoning has taken place, when the inflammatory symptoms have already declared themselves. We are thoroughly convinced, that the use of acidulated drinks is in general prejudicial before the expulsion of the poison: 1st, because they are not favourable to the vomiting; 2nd, because they dissolve the active particles, and facilitate their absorption. (*Vide the detail of Experiments made with Opium*, p. 176, 177, et sequent.)

5th. When by means of these remedies we have succeeded in putting an end to the nervous symptoms, it will be neces-

sary without any delay to attend to the inflammation, which almost universally succeeds to the administration of poisonous substances of this kind. To this end, the acidulated drinks should be replaced by emollient infusions and decoctions, such as the infusion of mallow flowers, of violets, or a solution of gum arabic: the application of a few leeches to the abdomen may likewise be of service.

It rarely happens that any of the poisonous substances we have been speaking of, have been applied externally; should such a thing happen, it would be necessary to follow the same precepts, except the administration of evacuants; beside this, a ligature ought to be made above the part poisoned, and the wound should be cauterized, in order to prevent the absorption of the poison, and its being carried into the circulation.

979. The *Upas-Tieuté*, *Nux-Vomica*, bean of *St. Ignatius*, *Angustura Pseudo-Ferruginæa*, *Ticunas*, *Woorara*, *Upas-Antiar*, *Camphor*, and the *Cocculus Indicus*, as they produce effects different to those resulting from the preceding poisons, so they require, for their treatment, a peculiar method. *M. M. Magendie* and *Delile* have proved that sea salt, (muriate of soda, *Chlorure of Sodium*), which the Indians who have been wounded by the *Upas* make use of, is not the antidote to this poison, whether introduced into the stomach, or applied externally. The means which have proved most successful in their hands for doing away the effects of this substance, as well as of the *Nux-Vomica*, and the bean of *St. Ignatius*, consist in expelling the poison as speedily as possible, by means of emetics and tickling of the throat, and by opposing afterwards the asphyxia, which is the principal cause of death, by performing the operation of tracheotomy, and transmitting air artificially into the lungs. In a number of animals submitted to this mode of treatment, death has been greatly retarded, and has at last taken place only when the insufflation of the air was discontinued. In the cases where

these poisons have been applied to wounds made in the limbs, they prevented them becoming fatal, by drawing out instantly the weapon which had inflicted them, cauterizing the wound to the bottom, and passing a ligature above the wounded place. The efficacy of these precepts is confirmed by a fact generally known, that is, that a hæmorrhage of the limb operated on prevents the poisoning from taking place, because it prevents the blood from mixing with the deleterious substance. We have also found the utility of these means in the experiments which we have tried on the *Angustura*, *Camphor*, and the *Cocculus Indicus*. An emetic administered fifteen or twenty minutes after the ingestion of these poisons, has procured copious evacuations; the attacks have been less severe than usual, and it has been sufficient to prolong the insufflation for an hour, or an hour and half, *to prevent the animals from dying*. In some cases, we have deferred the administration of the emetic till the end of the first or second attack, and it has then been necessary to prolong the insufflation for three or four hours, in order to obtain the same results. Sometimes the animals would have died, but for the exhibition of a *draught* and *cathartic glysters*. It must be observed, that ether combined with water, and oil of turpentine, have appeared to us to produce a salutary influence towards restoring completely the health of animals that have been poisoned by any of these poisonous substances. We cannot dismiss this subject without impressing on the reader the importance which ought to be attached to the insufflation of air into the lungs: this operation requires considerable patience on the part of the practitioner; for it is only efficacious when employed for the space of several hours. We can warrant the having saved by this means fourteen animals out of twenty; and there is not the least doubt that they would have died in a state of asphyxia had it not been employed.

Mushrooms. We have tried the following experiments, in order to establish the respective value of vinegar, common

salt, ether, emetic tartar, and volatile alkali, in the poisoning by Mushrooms.

Vinegar. 1st. This vegetable acid possesses the property of dissolving the active part of the *Agaricus Muscarius*, and of the yellow hemlock Mushroom, to such a degree, that any one may with impunity eat either of these Mushrooms when cut into slices, and exhausted by this acid; but the liquor itself is extremely poisonous. This is conformable to the results obtained by *M. Paulet*. 2nd. These Mushrooms introduced into the stomach with vinegar, and in a quantity sufficient to prove fatal, put an end to life in less time than they would if the vinegar had not been administered, provided that the poison be not vomited, which undoubtedly depends on the property this poison possesses of dissolving the poisonous parts, the absorption of which becomes undoubtedly much easier. 3rd. Vinegar and water have appeared to us very serviceable in this kind of poisoning, when the poisonous Mushrooms have been expelled by evacuants.

Common Salt (Muriate of Soda) dissolved in water, possesses, like vinegar, the property of dissolving the active parts of these Mushrooms, and consequently presents the same advantages and disadvantages as that vegetable acid.

Sulphuric Ether, employed so much of late in the treatment of this kind of poisoning, is not free from danger when administered before the expulsion of these Mushrooms; for it likewise possesses the property of taking up their poisonous principle, as has already been noticed by *M. Paulet*; but it has appeared to us of excellent utility after the use of evacuants. In fact, we have restored the health of a number of dogs that had taken of the *Agaricus Muscarius* a sufficient dose to kill them, by making them swallow alternately, after having evacuated the poison, ether, and water impregnated with ether (*de l'eau éthérée*), or the *Liquor Mineral. Anodyn. Hoffmann*.

The *Emetic Tartar*, and the *Emeto-Carthartics*, appear to us to be the remedies most to be depended on in this kind

of treatment ; for death almost constantly takes place whenever these Mushrooms have not been evacuated.

M. Paulet has proved, that the volatile alkali (*Ammonia*) is rather pernicious than salutary ; and that oil, theriaca, butter, and milk, are of no kind of use in this species of poisoning. (*Traité des Champignons*, par *M. Paulet*, tom. iii. ann. 1793, *Paris*.)

980. After having spoken particularly concerning each of the remedies proposed for the cure of the disease occasioned by poisonous Mushrooms, it is incumbent on us to establish the precepts by which the practitioner may be able to combat successfully the symptoms to which they give rise. 1st. He will facilitate the evacuation of the poison by means of emetics, or, what is better still, of *Emeto-Carthartics*, purgative draughts and glysters. In fact, the purgative medicines, in a great number of cases, deserve to be preferred to emetics, because the action of these Mushrooms is slow, and does not appear till ten or twelve hours after their ingestion ; that is to say, after they have passed into the intestinal canal. Therefore the patient should be made to take three or four grains of the antimoniated tartrate of potash, combined with four and twenty grains of ipecacuanha, and six or eight drachms of sulphate of soda dissolved in water ; there should likewise be administered, a draught composed of castor-oil and syrup of peach-flowers, and glysters of cassia pulp, senna, and sulphate of magnesia. When the Mushrooms have been well evacuated, it will be well to use a few spoonfuls of a mixture strongly impregnated with Ether ; and, should the patient complain of pains and irritation in the abdomen, recourse should be had to mucilaginous drinks. It sometimes happens, in this kind of poisoning, that the antimoniated tartrate of potash, by itself, produces no evacuation. “ The late Princess of Conti,” says *M. Paulet*, “ on her way from the court to Fontainebleau, in the Autumn, having perceived in the forest a number of poisonous Mushrooms, caused them to be gathered,

taking them for wholesome ones, and ordered her cook to serve them up at dinner, notwithstanding all that could be said against it. She had at her table, amongst other persons, the Bishop of Langres; and herself ate more of them than all the rest. Two hours after dinner, she felt an inclination to vomit, with fainting, and great anxiety; remained some time in a state of insensibility, stupor, and syncope, which caused great alarm for her life. Twenty-seven grains of emetic tartar, which were given in the course of the day, had not produced any effect, when the juice of horse-radish, and more especially a glyster prepared with a strong decoction of tobacco, procured a complete evacuation upwards and downwards,* which caused her to throw up the Mushrooms in the same state as she had eaten them. She passed blood by stool, and there was for a time an apprehension of an inflammatory state of the bowels, in consequence of the excessive irritation produced by the medicines. She was a very long time in recovering, and milk greatly contributed to her final restoration." 2nd. It would be imprudent to administer irritating purgatives, if the inflammation of the abdomen has already made a rapid progress: so likewise, if there should be fever joined with a painful tension of the belly, cardialgia, and dryness of the tongue, accompanied by extreme thirst, and a burning heat of the skin, as well as in the mouth and throat, it will be necessary to have recourse to bleeding, and other antiphlogistic means. *Forestus* speaks of a young person who had been poisoned by Mushrooms, whom he cured by bleeding on the sixth day of the disease. 3rd. When all these symptoms shall have disappeared, tonics should be had recourse to, such as white wine, bark, &c.

Alkohol and other Spirituous Liquors. Drunkenness, when not carried to a very high pitch, goes off of itself in the course of seven or eight hours. In any case where it might

* We have proved that the decoction of tobacco, when injected into the rectum of dogs, constantly produced vomitings.

be protracted to a longer period, and the patient be plunged into a state of deep coma, it would be best to have recourse to emetics, and afterwards to acidulated drinks. Bleeding may be had recourse to where the patient is young, robust, and of a decidedly sanguineous temperament. Irritating glysters should likewise be employed, and washing with vinegar over the whole surface of the body.

Asphyxia proceeding from the Vapour of Charcoal, and Carbonic Acid Gas. 1st. It will be necessary to begin by undressing the person thus asphyxied, and exposing him to the open air, placing him on the back, with the breast and head somewhat more elevated than the rest of the body, in order to facilitate the respiration. 2nd. The breast and face should be sprinkled with cold vinegar and water; at the expiration of three or four minutes, these parts should be wiped with hot towels, and the patient should be placed in a bed quite hot, where he should remain two or three minutes, after which, the aspersions should be repeated. This practice is essentially necessary, for the body will in the end become insensible to the action of cold water. 3rd. By means of a tube, atmospheric air should be blown into the lungs through the mouth, or, what is better still, through one of the nostrils, the other being compressed by the fingers, in order to prevent its escaping; and, for the purpose of facilitating the play of the organs of respiration, napkins dipped in very cold liquids should be applied repeatedly to the abdomen, and kept there only two or three minutes, when they should be replaced by cloths which are very hot. Should these means prove ineffectual, an opening may be made in the trachea, and a small tube introduced, which may be blown into by the mouth, or with a small pair of bellows. 4th. The patient should be made to swallow some cold water slightly acidulated with vinegar. 5th. Frictions should be used over every part of the body with a heated napkin, or with a piece of linen dipped into camphorated spirit of wine, *eau de Cologne*, spirit of

lavender, or any other stimulating liquor: the soles of the feet, and the whole course of the vertebral column, should be irritated with a strong hair brush. 6th. Lighted matches with plenty of brimstone should be held under the nose, in order to irritate the pituitary membrane, or the patient should be made to snuff up some volatile alkali, or *Hungary water*. 7th. Glysters should be administered of vinegar and water; and, after that, others of common salt, senna, and sulphate of magnesia. 8th. When, after having employed general frictions, the heat of the body is restored, recourse may be had to bleeding at the jugular vein, cupping, and the *moxa*. 9th. Emetics and fumigations of tobacco should be avoided. 10th. Lastly, when the person asphyxied shall be completely restored to life, he should be placed in a warm bed, where the air has free access, and some hot wine with a few spoonfuls of some stimulating mixture should be administered to him.

Ergotted Rye. Read is the author who appears to us to have given the best precepts for the cure of the disease termed *Ergotisme*: “Should the little degree of activity of the *Ergot* when taken in small dose,” says he, “produce only fever accompanied by convulsive symptoms, spasmodic motions, and confusion of the head; these phenomena require a treatment peculiar to themselves, with this difference only, that the use of acid drinks ought to be continued through all their different stages. In those cases where fixed pains, numbness, and the cold which succeed to them announce the approach of the dry gangrene, the following treatment is most proper to prevent it, and to arrest its progress, in fine to render its consequences less terrible.

“The state of the pulse alone should determine the necessity of bleeding, a remedy that should in all cases be employed with great moderation. Emetics administered in the beginning of the disease, produce salutary effects; but they are indicated only when we can be assured that the nauseas do not depend on the irritation of the stomach alone, and the

bitterness of the mouth shews a congestion of foul humours in the *primæ viæ*. Ipecacuanha in infusion, to the dose of a drachm, sharpened with a grain or two of stibiated tartar, fulfils this indication without any remarkable trouble. The day after the emetic, the patient should be purged by a gentle cathartic, if there be no fever, or but in a slight degree: in that case, purging glysters should take place of the draught. An infusion of elder flowers should be given for the common drink of the patient, with infusion of marshmallow and barley water, to which may be added four spoonfuls of vinegar, as much honey, and a grain of emetic tartar to each pint of the fluid. We may substitute for this drink a weak lemonade with little sugar, and sharpened likewise with the stibiated tartar.

“ As soon as the patients complain of numbness and coldness of the limbs, there should be applied to the parts affected, cloths soaked in a decoction of aromatic plants, but, previous to their application, the parts should be rubbed with the hand or some flannel: large blisters should be applied to the parts in the immediate vicinity of the benumbed limbs. The patients should immediately begin with the use of the following decoction. Take four ounces of good cinchona in coarse powder, half an ounce of sal ammoniac; boil the whole in a pot of spring water; towards the end of the decoction add to it two *pugilli* of chamomile flowers. The patient should take every three hours four ounces of this drink. Should the numbness and coldness continue after the application of the aromatics, the action of the blisters, and the use of the decoction just pointed out, this last must be employed to foment the parts threatened with gangrene.

When the limbs affected actually mortify, Read recommends the fomenting them with the following preparation. Take four ounces of calcined alum, three ounces of Roman vitriol, one ounce of common salt; boil the whole in two pints of water, till reduced to half. Should sphacelus notwithstanding all these means take place, and the amputation of the limb

become necessary, we must wait till nature herself points out the time and place for this operation, by a line of separation between the living and dead parts." (Op. citat.)

Odoriferous Flowers. We must begin by removing the flowers that surround the patient; after which, the disease they have occasioned must be attended to. Asphyxia will be best combatted by the means we have before pointed out; head-aches, syncopes, and nervous affections will require the use of tonics and antispasmodics.

CHAPTER VI.

CLASS VI.—SEPTIC AND PUTREFYING POISONS.

981. **T**HE name of Septic Poisons has been given to such as produce a general debility, dissolution of the humours, syncope, and which do not in general alter the intellectual faculties.

OF THE HYDRO-SULPHURIC ACID GAS (SULPHURATED HYDROGEN).

982. *Characters.* This gas is colourless, transparent, possessed of an excessively fetid smell, similar to that of rotten eggs; *it reddens the infusion of tournesol*; when set on fire in the open air, it burns with a bluish flame, and deposits on the sides of the bell which contains it, a certain quantity of sulphur of a yellow colour; when mixed with *chlorine* (oxygenated muriatic gas) it is instantly decomposed, parts with its hydrogen, which becomes converted into hydro-chloric acid, and the sulphur is set at liberty; it is soluble in water, and gives a clear yellow precipitate with the arsenious acid, a black one with the salts of copper, of lead, and of bismuth. These different precipitates are *sulphurets* of arsenic, copper, lead, and bismuth: whence it follows, that the hydrogen of the hydro-sulphuric acid seizes upon the oxygen of these metallic oxydes to form water; whilst the sulphur and the metal resulting from the operation combine and produce an insoluble sul-

phuret. These properties are more than sufficient to distinguish the Hydro-Sulphuric Acid Gas from all other bodies.

ACTION OF HYDRO-SULPHURIC ACID GAS ON THE ANIMAL ECONOMY.

983. It has long been known that animals die in a few seconds after being immersed in the Hydro-Sulphuric Acid Gas, so that it has in consequence been regarded as one of the most deleterious of bodies. *M. Chaussier* has made on this subject a series of curious experiments which he has given in an excellent Memoir published in 1802;* *M. Nysten* has since undertaken some new experiments on the same subject, which are extremely interesting, and which may be regarded as the complement of *M. Chaussier's* labour.† We have carefully repeated the experiments of these two physiologists, and have found them extremely correct: therefore from their writings we shall give the following extract.

Experiment 1st. Any animal, of what kind soever, dies in the space of a few seconds if immersed in an atmosphere of Hydro-Sulphuric Acid Gas; it is somewhat longer in dying if this gas be mixed with a very great quantity of atmospheric air. According to *M. M. Thénard* and *Dupuytren*, it is sufficient that the air contains $\frac{1}{1500}$, in order to kill a bird in a very little time: that which contains $\frac{1}{800}$ produces death to a dog of middle size, and a horse in the end dies in an atmosphere containing $\frac{1}{250}$ part of it. After death, it is found that the nasal cavities and bronchia are lined with a viscid mucosity of a brownish colour; the blood is thick and black; the muscles possess hardly any of their contractility, and are likewise blackish; the lungs, liver, spleen, kidneys, brain, and in general all the organs which receive a great number of blood-vessels, have a brownish or blackish tinge; there is a di-

* *Journal de Sedillot*, Octobre, 1802, p. 19.

† *Op. citat.* p. 126.

minution of the consistence of all the soft parts, which are easily torn, exhale a fetid smell, and pass rapidly into a state of putrefaction.

Experiment 2nd. Ten *centimetre* cubes of Hydro-Sulphuric Acid Gas, were injected into the jugular vein of a dog whose pulse was beating a hundred and two strokes in a minute. A few seconds after, the animal appeared very much agitated, and uttered acute cries; but soon after became quiet, the pulse was extremely feeble, and beat only sixty-eight strokes in the minute. Eight minutes after the injection, the animal had recovered his strength, and the pulse was beating seventy-eight. A fresh injection was then made of twenty *centimetre* cubes of gas: instantly after, cries, convulsions, bending backward of the body, pulse imperceptible, death. The body was immediately opened; the sanguineous system contained no gas; the heart was distended with black blood; the lungs exhibited a beautiful rose colour.

Experiment 3rd. At fifty-two minutes after nine, ten *centimetre* cubes of gas were injected into the jugular vein of a dog of middle size, whose pulse was beating a hundred and six times in the minute. Immediately after, the animal was agitated, made a few deep inspirations; his pulse beat only ninety. At fifty-five minutes after five, the breathing was natural, and the animal calm. The same dose of the gas was again injected; the breathing became loud, and extremely frequent; some convulsive movements appeared; the pulse beat seventy-two strokes in the minute: these symptoms in a short time subsided. At two minutes after ten, a fresh injection of the same quantity of gas; instantly the animal was agitated, and cried out, the limbs were stretched out, the breathing was suspended, and he appeared to be dead. At the expiration of a few minutes, the breathing was restored; it was at first deep and rare. At seven minutes after ten, it was performed in the natural manner. The animal was let loose; he remained lying on the side, in a state of great pros-

tration; his limbs were very much inflamed, and his pulse beat seventy times per minute. Three minutes after, he appeared less overcome; he supported himself upon the anterior extremities; his head nodded from time to time; a few moments after, he was able to walk, but his progress was vacillating. At fifty-five minutes after ten, he was upon his feet, and appeared stupified, without shewing any signs of suffering; the pulse was feeble, and beat ninety times in the minute. The next day, he was recovered. One of the crural arteries was opened, and there issued blood of a vermillion colour. (*Nysten.*)

Experiment 4th. Forty *centimetre* cubes of Hydro-Sulphuric Acid Gas were injected into the right pleura of a dog of middle size. At the same moment, the trunk was bent backward, the limbs became stiff, an emission of urine and excrement took place, and the animal died. He was opened a short time after. The pleura that had been operated on was of a greenish colour; the heart, which was not opened till after four and twenty hours, contained black coagulated blood, without any concretion, apparently gelatinous. There was no gas in the sanguineous system.

Experiment 5th. The same experiment repeated on another dog, with twenty *centimetre* cubes of gas, presented at first similar phenomena. At the end of one minute, there was no longer any respiratory movement; the loco-motive muscles were agitated by slight convulsions; the pulse was frequent and strong, but soon after became imperceptible. To this state succeeded a general relaxation. Two or three minutes after, the animal made a deep inspiration, the pulse became again perceptible, and the respiration was restored, but animal life appeared extinct for a quarter of an hour; he was no longer able to make two steps without staggering and falling. Half an hour after the injection, the cerebral functions no longer exhibited any sign of serious lesion; the animal was affected with a general trembling and foaming at the mouth.

An hour and five minutes after the injection, he still staggered in walking. The next day, he was entirely recovered.

Experiment 6th. When Hydro-Sulphuric Acid Gas, or Hydro-Sulphuric water are injected into the subcutaneous cellular texture of rabbits and frogs, death takes place in the course of a few seconds. Dogs also die in a very short time, amidst convulsions, and uttering acute cries. The internal organs present no remarkable lesion, but the vessels distributed over the portion of cellular texture where the injection is made, are distended by a black viscid blood, or else by blood of a greenish tinge: the more superficial muscles partake of this tinge.

Experiment 7th. Rabbits, ducks, and young guinea-pigs, perish in a few minutes, when the whole of their body, except the head, is plunged into bladders containing Hydro-Sulphuric Acid Gas. One rabbit died, that had only the thigh immersed in the bladder. Death takes place more speedily when these animals are plucked. On opening their bodies, the subcutaneous vessels were found full of a brownish, viscid blood, the cellular texture soft, the skin easily torn; but the other parts retained their natural colour and consistence. A dog was submitted to an experiment of this kind, by exposing to the action of the gas only one of his hind legs that had been shaved. The animal had experienced nothing at the expiration of an hour; which doubtless depends on the circumstance of the absorption being null, or extremely weak, on the surface of the *cutis* of these animals.

Experiment 8th. The Hydro-Sulphuric Acid Gas, and the Hydro-Sulphuric water, when injected into the great intestines of rabbits and of horses, causes the death of these animals in less than a minute, and the abdominal vessels are found to be filled with black blood, very thick; the great intestine of a brownish colour; the liver, the spleen, and the kidneys darker than in their natural state: there is no alteration in the viscera of the thorax, and head. Similar effects are ob-

served, when these poisons are injected into the stomach. After death, the blood is fluid, and of a deep brown colour in the arteries; the mucous membrane of the stomach is soft, tears with the greatest ease, and presents a blackish colour. The other viscera appear sound.

OBSERVATIONS.

M. M. Dupuytren and *Thénard* have proved that the asphyxia of privies, on which subject *M. Hallé* composed a very fine work in 1784, depends sometimes on Hydro-Sulphuric Acid Gas, or on the Hydro-Sulphate of Ammonia. The following are the observations collected respecting the human species, by *M. Dupuytren*: sometimes the patients are strongly asphyxied, and death takes place in a very short time: but under other circumstances, the symptoms of asphyxia are less intense; in that case the patients may be carried into the open air; and it is observed, that after having lain some time in a state of apparent death, they make deep inspirations; the breathing becomes restored by degrees, and continues to be laborious; the motion of the heart becomes perceptible; nevertheless, the pulse is weak and small; the digestive and loco-motive apparatus have lost their contractile force; the functions of the brain are suspended; and if the patient finally recovers his health, he is a long time in re-establishing his strength.

On taking a view of the symptoms hitherto observed in the human species and animals submitted to the influence of the Hydro-Sulphuric Acid Gas, they may be reduced to the following: acute cries, convulsions, violent contractions of the abdominal muscles, agony; pulse unequal, intermitting, convulsive; respiration sometimes accelerated, sometimes suspended, often accompanied with a throbbing of the flanks; loss of lustre of the eyes, and sensation of cold in the ears. (*Chaussier.*)

984. The preceding facts induce us to conclude:

1st. That the Hydro-Sulphuric Acid Gas, and the Hydro-Sulphuric water, are energetic poisons for all sorts of animals; that the gas is extremely active when respired; that it is less so when introduced into the pleura or jugular vein; that it is still less so when injected into the cellular texture, into the stomach, or intestines; lastly, that its action is less rapid when applied to the surface of the skin, and, as *M. Nysten* has observed in this instance, its action is so much the more energetic according as the animals are of less bulk; so that a man may without any inconvenience submit himself to the use of sulphureous baths, in which this gas is disengaged, provided that he does not stay in them too long, and that the gas does not enter into the lungs;

2nd. That it is completely absorbed without undergoing the least decomposition; that, when carried into the circulation, it induces a general debility, a prolonged alteration in the texture of the organs, and principally in the nervous system, and probably in the composition of the blood;

3rd. That nevertheless, it may be injected in a small dose into the venous system of animals, without producing any fatal symptoms;

4th. That it does not kill by effecting the distension of the pulmonary ventricle of the heart, since it is extremely soluble in the blood;

5th. That it appears to act on the human species as on animals.

TREATMENT OF THE ASPHYXIA PRODUCED BY HYDRO-SULPHURIC ACID GAS.

985. We should begin by putting in practice all the means which we have advised when speaking of Asphyxia from charcoal (*vide* p. 366); after which, a few spoonfuls of olive oil may be administered, with the intention of exciting vomiting; at least this practice has been attended with success in persons

who have been asphyxied in privies. Should it be intended to destroy the infection in a place where this gas exists in great abundance, it will be necessary to have recourse to chlorine, which possesses the property of decomposing it (*vide* p. 370 of this Part). *M. Dupuytren* has put an end to the Asphyxia in a number of animals, who had inspired the Hydro-Sulphuric Acid Gas, by this method.

ACTION OF CERTAIN PUTREFIED SUBSTANCES ON THE ANIMAL ECONOMY.

Experiment 1st. At eight in the morning, half an ounce of the blood of a putrefied dog was applied to the cellular texture of the inside of the thigh of a robust dog of middle size. The animal experienced no remarkable symptom in the course of the day. The next day, at five in the morning, he vomited after having made a number of fruitless efforts; he was dejected, and lying on the side; he made from time to time deep inspirations; he was raised up, and walked without staggering, but slowly, and very soon lay down again; the dejection went on increasing, and he died at half past ten. Three hours after, the body was opened; the limb operated upon, and all the corresponding side up to the third sternal rib, were very much inflamed, and of a livid red colour; the digestive canal appeared sound; the lungs contained a tolerably large quantity of black fluid blood; there were found in the ventricles of the heart some blackish coagula.

Experiment 2nd. The same experiment was repeated upon another dog not so strong as the preceding, who died eighteen hours after the application of the blood, and exhibited the same results on dissection.

Experiment 3rd. About six drachms of the bile of an ox in a state of putrefaction, were injected into the cellular texture of the thigh of two great dogs. At the end of fifteen hours, these animals made some efforts to vomit, and threw

up a quantity of alimentary matter ; they uttered plaintive cries, and fell into a state of dejection. Six hours after, they were found dead. It was impossible to find the least alteration in the internal organs. The whole of the side corresponding to the limb operated on, was in a state of suppuration, and of a clear red colour, whilst the opposite side was quite sound.

Experiment 4th. Two dogs were operated on in the same manner, and a portion of stomach completely putrid, but which had only undergone a softening of its substance, was applied to their cellular texture. They did not experience any accident ; the appetite did not fail them, and the wound was healed up in the course of a few days.

Experiment 5th. As a substitute for these substances, a portion of the *encephalos*, so putrefied that it was in the form of a thick soup, was employed. The animal, which was a robust one, died in a state of dejection eighteen hours after. The inflammation of the wound was somewhat extensive, but the suppuration was tolerably abundant.

Professor Fodéré justly classes corrupted aliments amongst the poisons. “ The vomitings,” says he, “ fetid discharges through the nose, and the syncope, which take place immediately after having taken these horrible meats into the stomach, give us notice of the dangers which we incur, and of the remedies proper to be had recourse to.” He relates beside, that at the siege of Mantua, a number of persons who were obliged to feed on horse-flesh half putrid, had the dry gangrene and the scurvy.

986. The facts which we have just related, do not appear to us sufficiently numerous to decide whether the different symptoms and death produced by putrefied substances depend on the local irritation they produce, or on their being carried into the circulation. It is our intention to compose a work on this subject, in which we propose to examine: 1st, *What are the chemical alterations which the animal fluids undergo after*

death? 2nd, Their action on the animal economy, or the kind of local and general disease to which they give rise when in a state of putrefaction; 3rd, The decompositions that the animal fluids undergo in certain diseases during the life of the patient, (a decomposition which appears to us incontrovertible, notwithstanding the opinions of the solidists) and the affections they produce by their contact with the living texture.

OF VENOMOUS ANIMALS.

987. The name of *Venomous Animals* is given, 1st, to those which contain a reservoir for poison, and whose bite, although trifling, produces severe symptoms, followed sometimes by death; 2nd, to those in which no such reservoir has been discovered, and which occasion the most terrible symptoms after being eaten; 3rd, to those whose fluids have been so vitiated by antecedent diseases, that their contact produces likewise fatal effects. Those animals too have been qualified with the name of *Venomous*, in a state of health, who contain no reservoir of poison, but whose sting produces symptoms which any acute body whatever would occasion. We shall treat successively of these different sections.

OF VENOMOUS ANIMALS, WHOSE BITE OR
STING IS ACCOMPANIED BY SYMPTOMS
MORE OR LESS SEVERE.*

OF THE VIPER.

(VIPERA BERUS, COLUBER BERUS, ANGUIS CINEREA,
MACULA DORSI FUSCA, LONGITUDINALI, DENTATA
LINNÆUS.)

988. THE genus *Viper*, as adopted by *Latreille* and *Daudin*, comprises all those serpents that have the head triangular, flattened, broad posteriorly, terminated like a snout, with projecting edges, and which contain *venomous fangs*.

Specific Characters. Its length is commonly two feet, sometimes, but rarely, from twenty-eight to thirty inches; it is about an inch in thickness; its colour varies from an ash or greenish gray, to the darkest gray; it is always deeper on the back than on the sides, where it is constantly marked with brown spots symmetrically laid out. It exhibits on the back, a black band arranged in rhomboidal figures, which extends from the neck to the extremity of the tail: this band is sometimes interrupted, but most commonly is complete. The belly and the part underneath the tail, are furnished with several transversal plates, of the colour of polished steel; the number of these plates is generally a hundred and forty-six under the belly, where they are simple; and thirty-nine under the tail, where they are smaller and double, or disposed in two rows. The head of the viper is broader posteriorly, flatter, and not so

* These animals might moreover be subdivided into two sections: 1st, those that emit a venomous fluid contained in some reservoir, such as the Vipers, the Crotali; 2nd, those that are destitute of this fluid, and act only mechanically. Comparative anatomy has not yet sufficiently enlightened us on this subject to make a proper use of this division.

long as that of snakes; the end of the head is as it were truncated, and forms a prominent ridge, turned up like the snout of a hog, covered with scales broader than those of the back, spotted with black and white. On the top of the head are seen two black lines, which run from the fore to the hind part, diverging in such a manner as to resemble the letter V: these lines are separated by a brown spot, in the shape of the top of a spear. The tail, which is shorter than that of snakes, is somewhat obtuse, and thicker in the male than in the female. The eyes are bright, sparkling; its look is fierce, especially when irritated. The tongue is gray and bifurcated, and when the animal is animated, it agitates it with impetuosity, in such a manner, that it appears like a flaming dart. These characters are more than sufficient to distinguish the Viper from the common snake, and the *Orvet* (*Cecilia*).

The principal varieties of the common Viper are, 1st, those which have the band on the back formed with round spots, and that on the tail with transverse ones; 2nd. The common reddish Viper, having the neck extremely small, and the head party-coloured; 3rd. The common Viper, with a white spot, surrounded by a brownish arched line upon the occiput; 4th. That which exhibits on the top of the head a spot divided into several parts; 5th. The adder (*Vipère-Aspic*), which has the angular and black band on the back frequently interrupted by the brown or red colour of the ground, with the spots of the sides more distinct.

The common Viper is only found in Europe. It is met with in Italy, Spain, Germany, in the British Isles, the plains of Siberia, in the vicinity of Paris and of Fontainebleau, &c.

989. The venom of the Viper is contained in a bag situated on both sides of the head, beneath the muscle of the superior jaw; this last exhibits two moveable teeth, very sharp towards the point, hollowed throughout their length. When the animal intends to bite, he presses the bag by means of the muscle; the venom comes out, arrives at the base of the tooth, passes

through the sheath which envelopes it, and enters into its cavity by a hole which is found at this base ; then it flows along the hollow of the tooth, and issues by the hole which is near its point, in order to penetrate into the wound.

PHYSICAL AND CHEMICAL PROPERTIES OF THE VENOM OF THE VIPER.

990. It is neither acid nor alkaline, for it does not redden the tincture of tournesol, nor turn the syrup of violets green. It is neither acrid nor burning ; it produces on the tongue only a sensation similar to that of the fresh fat of animals ; it possesses a slight smell, resembling that of the Viper's fat, but much less nauseating ; it gives no effervescence with acids ; when put into water, it sinks to the bottom ; if mixed with this fluid it renders it turbid, and slightly whitens it. It does not burn when exposed to the flame of a candle, or placed on burning coals. When fresh it is somewhat viscid ; and when dried it adheres like pitch. It appears to be of a gummy nature.

ACTION OF THE VENOM OF THE VIPER ON THE ANIMAL ECONOMY.

991. The celebrated *Fontana*, who made near six thousand experiments on the bite of the Viper, concluded that the following facts might be established.

1st. The poison of the Viper is not a poison for all animals ; *leeches* do not die even when it is introduced into their wounds ; the same thing happens to slugs, snails, the adder, the snake, the *orvet* ; *eels*, the *Viper* itself,* small *lizards*,

* The author is evidently mistaken here in asserting, on the authority of the Abbé Fontana, that the venom of the Viper is fatal to the Viper itself. The title of the Vth Chapter, Part I. vol. i. of his work, runs thus : *Le venin de la Vipère n'est pas un poison pour son espèce* ; and he has proved incontestably

and all warm-blooded animals die from it; death takes place with great difficulty in the *tortoise*, in whatever part it may be bitten.

2nd. The venom of the Viper is not uniformly fatal, except in very small animals; it is so much the more dangerous in the larger ones, in proportion as the Viper happens to have a greater quantity of venom in reserve; as it may bite the oftener, and in the greater number of places; and probably as the heat of the weather may be more intense. The hundredth part of a grain introduced into a muscle, suffices to kill a sparrow. Six times that quantity is required to destroy a pigeon; and, keeping in view the size and weight, *Fontana* has calculated, that it would take about three grains to kill a man, and twelve to destroy an ox. Now, as a Viper carries in his vesicles only about two grains of venom, which it does not exhaust even after several bites, it follows, that a man might receive the bite of five or six Vipers without dying from it.*

3rd. The venom of two Vipers injected into the jugular vein of several large rabbits, produced death in less than two minutes, amidst screams and strong convulsions. The blood in the ventricles of the heart was coagulated. *Fontana* adds, moreover, that the intestines, the stomach, mesentery, and abdominal muscles were inflamed.

4th. The venom of the Viper, applied by the bite of the animal, produces the following symptoms: sensation of acute

by a number of experiments, that the venom is perfectly harmless to animals of its own species.—TRANSLATOR.

* *M. Bosc* relates a curious fact, of which he was a witness during his residence in America: “two horses were bitten in one enclosure, on the same day, by a black Viper; one on the hind leg, the other on the tongue: this last died in less than an hour, and the other was quit for a swelling of a few days’ continuance, and a debility of a few weeks. The loss of the former was caused by a violent inflammation, which closed up the glottis, and produced an asphyxia. Should not the bite of the Viper be considered as much more dangerous, and even fatal, when the parts bitten are not far distant from the heart?” (*Dictionn. d’Hist. Natur.*, Article *Vipère*.)

pain in the part wounded, which extends over the whole limb, and even to the internal organs, with tumefaction, and redness which passes afterwards to livid, and gains by little at a time on the neighbouring parts; considerable syncope, pulse frequent, small, concentrated, irregular; difficulty of breathing, copious and cold sweats; disturbance of vision, and of the intellectual faculties; heaving of the stomach; bilious and convulsive vomitings, followed almost universally by a general yellowness; sometimes pains in the umbilical region. The blood which flows at first from the wound, is frequently blackish; some time after, there issues out a sanies, and gangrene takes place when the disease is about to terminate in death. Climate, seasons, temperament, &c., exert a singular influence on the nature and progress, more or less rapid, of the symptoms occasioned by the bite of these animals. The symptoms are much more to be dreaded in South America, and during summer, than in Europe, as *M. Bosc* has observed. In persons that are weak and timid, that have a full stomach, the symptoms make their appearance with much greater rapidity, and are more serious than in robust persons, and such as are not easily frightened.

5th. The venom of the Viper applied to the skin of Indian capons and of rabbits slightly abraded, is not fatal.

6th. It produces only a slight disease of the skin in guinea-pigs, and one somewhat more intense in rabbits.

7th. This disease is circumscribed in that part of the skin which has been touched by the venom.

8th. When the Viper bites the skin of these animals quite through, they die in a short time.

9th. The venom appears not to be mortal, if it penetrates only into the cellular texture.

10th. It is altogether innocent if simply applied to the muscular fibres.

11th. Animals bitten or wounded by a venomous tooth of a Viper in the breast, belly, intestines, and liver, die in a space of time of greater or less duration.

12th. The contrary is observed when the venom has been applied to the ears, the pericranium, the periosteum, dura mater, the brain, marrow of the bones, the transparent cornea, the tongue, lips, palate, and stomach: it happens even frequently enough, that a number of animals submitted to these experiments exhibit no sensible phenomenon.

13th. The Viper's venom, when applied upon the nerves, does not produce any effect, nor does it accelerate the death of the animal; it is as innocent for the nerves as pure water, or simple gum arabic.

14th. It produces no sensible change on parts detached from an animal, and which consequently are still palpitating.

15th. The action of this venom is not instantaneous; a certain time is necessary before the effects become sensible, either in the part bitten, or in the other organs: this time varies in different animals according to their constitution, size, &c. According to *Fontana*, it may be reckoned, in a certain number of animals, from fifteen to twenty seconds.

16th. The symptoms which it produces depend on its absorption, its being carried into the circulation, and on the action it exerts on the blood, which it partly coagulates, and on the nervous irritability, which it destroys by conveying into the fluids a principle of putrefaction.

17th. It preserves its energy in a Viper's head that has been cut off a long time, or when it has simply been left in the cavity of the tooth separated from the alveolar process. Animals have been known to die from having been pricked by the tooth alone. When dried for several months in an open place, it loses its property, and leaves no impression on the tongue.

18th. Animals die more speedily when they have been bitten an equal number of times in two places, than when bitten in one only.

19th. The part which has received alone as many bites as

the others together, is subject to an external disease much more considerable.

We may add to these observations the results of a work undertaken by *M. Paulet*, on the Viper, called of *Fontainebleau*, which is also a *Vipera Berus*, notwithstanding the opinion of this physician, who regards it as a particular species. This work proves, contrary to the assertion of *Fontana*, that the bite of the common Viper is capable of becoming fatal to the human species. (*Observations sur la Vipère de Fontainebleau*, published in 1805.)

1st. The venom it is furnished with, when inoculated by a wound, or by the prick which it makes, is in general fatal to men and animals, principally for such as are weak and easily frightened. A child seven years and a half old, was bit below the inner ancle of the right foot, and died seventeen hours after. Another child two years old, expired three days after having been bitten in the cheek. A horse, which had been weakened by previous disease, died likewise from a bite in the cheek, at the end of eighteen hours.

2nd. The most common symptoms from the action of this venom are; a tumour, at first firm and pale, afterwards reddish, assuming a gangrenous character, and making a progress more or less rapid on the side next the heart; this tumour is shortly after followed by syncope, vomitings, convulsions, and death: the intensity of these symptoms is in an inverse ratio to the size of the animal bitten, or to the distance of the wound from the heart, and the slowness of the pulsations of the arteries.

The following is an observation of the bite of this Viper.

Laurino, a grenadier of the Imperial Guard, was severely bitten on the second phalanx of the fore-finger of the left hand. He experienced at the moment a pain excessively sharp; the part bitten swelled up almost immediately after. A strong ligature was made on the top of the first phalanx, near its articulation with the metacarpus: the inferior part

swelled up considerably. *M. Paulet*, who saw this grenadier an hour afterwards, found the skin of the bitten finger in a state of extreme tension, and more pale than the surrounding skin. He made eight or ten scarifications along the whole length of the tumefied finger. The patient, who had experienced neither syncope, nor vomiting, nor any pain, save that produced by the bite, experienced a kind of weakness similar to what might have been caused by a profuse bleeding. The part when untied, was completely emptied. He was made to take a drachm of theriaca in a glass of wine, and the part was dressed with compresses of camphorated spirit of wine. An infusion of the flowers of the *Tilia* was administered to him. The next day, the part bitten was in a good condition; but some person caused the volatile alkali to be applied to it, which produced a severe pain and tumefaction, which communicated itself from the hand up to the top of the arm: the compresses soaked in camphorated spirit were renewed; a perspiration soon came on, and the patient was perfectly restored at the end of seventeen days.

OF THE *VIPERA NAJA* (COLUBER *NAJA* OF LINNÆUS, *CHINTA NAGOO* OF THE INDIANS, *COBRA DE CAPELLO*).*

Experiment 1st. In the month of June, 1787, a dog was bit in the inside of the thigh by the *Comboo Nagoo* (a variety of this species of serpent). The animal immediately uttered very plaintive cries; he lay down two or three minutes after, and continued to complain and to bark. At the end of twenty minutes, he rose again; but could with difficulty sup-

* All which we are about to say of this serpent and the four following, is extracted from the admirable work of Russel, entitled: *An Account of Indian Serpents collected on the Coast of Coromandel*, by Patrick Russel. London, 1796. 2 vols. in fol.

port himself, and was not able to walk; his organization appeared deeply affected: he soon lay down again, was greatly agitated; a few moments after, convulsive movements; and he died twenty-seven minutes and a half after being bit.

Experiment 2nd. In the month of July, in the same year, a great strong dog was bit in the inside of the thigh by another variety of the *Vipera Naja*. Two minutes after, the thigh was drawn up, a symptom which in general proves that the animal is under the influence of the poison. He continued however to walk for an hour, supporting himself on the other three limbs, without shewing any other symptom. He then extended himself on the ground, appeared extremely unquiet, passed a stool, but uttered no cries. A short time after, he was agitated with violent convulsive movements in the head and throat; his posterior extremities were paralyzed, and he made fruitless efforts to rise. This state continued till the moment of death, which took place two hours after the bite.

Experiment 3rd. Immediately after, a black bitch was caused to be bitten by the same reptile, and nearly in the same place. Seeing that she exhibited no remarkable symptom at the end of an hour and half, she was made to be bitten by a *Cobra* which had not bit any thing for several days. The bite was made with fury: notwithstanding no symptom had made its appearance two hours after. During the hour which succeeded, the animal became a prey to all the symptoms previously related, and died five hours after the second bite.

Experiment 4th. On the 20th of July, in the same year, a large strong dog was bit at the same place by the *Scinta Nagoo*, a variety of the *Vipera Naja*. In a short time, he was under the influence of the poison, and at the end of half an hour, was extremely ill. The symptoms acquired greater intensity during the second hour: the breathing was laborious, especially when he was lying on the side. All at once he rose up, and howled horribly: he had a general trembling. A

short time after, he fell into a state of stupor : this continued about an hour. Four hours after the bite, he appeared to be recovered.

Experiment 5th. The same reptile, after having bitten another dog, pierced a fowl in the thigh, which had been previously rubbed with oil. At the end of a quarter of an hour, the animal began to be dejected, and moved with difficulty. These symptoms increased, and it expired an hour and twenty minutes after the bite. It had no convulsions.

Another fowl was bit, without any oil being previously applied. Seeing, at the end of four hours, that it exhibited no remarkable symptom, it was caused to be bit a second time. It survived two hours after the wound, and died likewise without convulsions. It was soon ascertained, by several experiments, that the application of oil to the part bitten did not prevent the effects of the venom.

Experiment 6th. In the month of November, a great dog was bit in the thigh by the *Male Nagoo*, a variety of the *Vipera Naja*. The animal experienced the symptoms described above, and expired fifty-six minutes after.

A very strong dog, bitten at two different times by the same reptile, lay down on the side, experienced a trembling in the muscles of the thigh, and was perfectly restored at the end of eight hours.

The bite of the *Arege Nagoo*, another variety of this species, produced the same symptoms in a robust dog, who died three hours after.

Experiment 7th. A very strong dog was bit in the thigh by a *Cobra de Capello*, that had lost its two longest teeth. Immediately after, the animal complained greatly ; nevertheless, the limb was not drawn up, and there was no apparent symptom a quarter of an hour after. At this moment, he made his escape, took a long run, and could not be brought back for an hour and half after ; he was extremely fatigued, and very much heated ; he refused water a quarter of an hour

after ; but he ate some bread soaked in this fluid. At the end of fifteen minutes, he vomited, barked, and appeared uneasy. The vomitings were repeated at the end of ten minutes, and the animal became furious ; he beat himself about in order to effect his escape, endeavoured to break the post to which he was tied, and barked continually. He lay down after the second vomiting, and appeared to experience a great agitation of the abdomen and stomach ; the muscles of the face were agitated with convulsive movements ; his extremities were not paralyzed, and he was able to walk : towards the end of the third hour, he was so furious, that it became necessary to tie his legs. From that moment the agitation and howlings diminished, but the convulsive movements in the face continued. This state continued about an hour, and he expired. The part bitten was almost black for about the size of a half-crown piece.

This experiment presents two remarkable phenomena ; viz. the non-appearance of the local symptoms before the running, and the backwardness of the appearance of these symptoms, which were not perceived till two hours after the bite.

Experiment 8th. Several fowls were bit by the *Cobra de Capello*. Oil of vitriol (sulphuric acid) was applied to the wound : they died much sooner than others which had been bitten at the same time, and on whose wounds no such caustic had been applied.

Experiment 9th. A pig was bit on the inside of the thigh by a *Cobra de Capello* which had been kept shut up for six weeks, and to which nothing had been given but some milk once a week. There was no sensible effect during the first ten minutes : then the animal lay down, and appeared to be affected : he uttered no complaint. Ten minutes after, his breathing became laborious, and he kept himself lying down on the side. He remained in this position for a quarter of an hour : then he was seized with convulsions, and expired about an hour after having been bit.

Experiment 10th. A *Cobra de Capello* known at Ganjam under the name of *Satanag*, bit another variety of *Cobra*, which did not appear to feel any effect from this bite : indeed, the marks of the teeth could not be perceived.

The *Coodum Nagoo* bit another reptile, known by the name of *Coultiab*, in the belly. The wound bled, and there was no other apparent phenomenon. The *Tartutta*, bit immediately after by the same reptile, in the same part, died at the end of two hours.

Experiment 11th. A number of fowls and pigeons were bit with impunity by the *Cobra de Capello*, which had been deprived of his teeth ; but, when the venom of this reptile was procured, and applied to these same birds, whether by pricking them, or by incision, they died after having experienced all the symptoms of poisoning.

Experiment 12th. An incision was made in the inside of the thigh of a dog ; and a certain quantity of the venom of the *Cobra de Capello* was introduced into the wound by means of the handle of a scalpel and a little lint : the animal was prevented from licking the wound. He did not appear to feel any decided effect ; but as he lost a considerable quantity of blood by the wound, it is to be presumed that the experiment was not well made.

Experiment 13th. Several wounds were made in the inside of the thigh of a strong dog, and to each them was applied some of the fresh venom of the *Comboo Nagoo*, a variety of this species ; the other thigh was pricked in several places by pins envenomed with the same poison. These punctures were deep, and penetrated the muscles. No symptom followed.

The same experiment was repeated with this poison inspissated by exposure to the air. It furnished the same results.

Experiment 14th. Some of the same venom was applied several times to the thigh of a number of fowls, both by incisions, and by punctures. There did not result from it any serious symptom, notwithstanding that these animals die in a

few minutes where they have been bitten by the serpent. A pigeon died seven hours after having been punctured in the muscles of the thigh by an envenomed lancet.

OBSERVATIONS.

1st. In the month of January, 1788, a woman of Malabar was bit in the lower part of the leg by a *Cobra de Capello*. *M. Duffin* saw her two hours afterwards. She had lost the faculty of seeing and feeling; the deglutition was so difficult, that it would have been impossible to have introduced any thing into the stomach; there was no spasm in any other part of the body; but since the accident, all the systems had been plunged into a state of torpor, which continued to increase. With some difficulty they succeeded in making her swallow one of the pills of *Tanjore* (for the composition of these pills, see the article *Treatment*); the wound was dilated, and mercurial ointment applied to it. Three hours after, a second pill was administered, which, like the first, produced no effect; lastly, a third was given her several hours afterwards, which produced alvine evacuations, and a slight moisture of the skin. Eighteen hours after the bite, the patient recovered the power of seeing and swallowing. During the three days which followed, a pill was given every morning, which occasioned nauseas, and increased the perspiration. The patient continued weak for eight or ten days, and in the end recovered.

2nd. An Indian was bit on the ankle by a large *Cobra de Capello*. At the end of a quarter of an hour, his jaws were locked together, and he appeared to be dead; the part bitten exhibited four very large punctures, to which was applied some *eau de luce*. Immediately, the patient gave signs of feeling, and drew up the leg. Two bottles of Madeira wine were heated, and he was made to swallow them, by forcibly separating the jaws, and introducing a funnel into the mouth. Almost the whole of the fluid went into the stomach. Half an hour after, the *eau de luce* was continued to be externally

applied for the space of three hours. The patient was so insensible, that he might have been thought dead if he had not breathed from time to time. This state continued forty hours, after which time, he appeared to recover his feeling. It was not till twelve hours after, that he began to speak, and he continued for several days weak and languid. The Madeira wine appears to have been here, as in a great many other similar cases, an heroic remedy; at least, the cure of the disease must not be attributed to the *eau de luce*. (*Russel.*)

3rd. In the beginning of June, 1788, after sun-set, a man forty years old, was bit in the fleshy part between the thumb and fore-finger by a *Cobra de Capello*. He experienced instantly a severe acute pain in the part bitten, which in a short time extended to the top of the arm; he experienced nauseas, but did not vomit. In less than an hour the hand and wrist were considerably swelled, the shoulder of the same side was very painful, the head heavy, accompanied with a great tendency to sleep, so that he passed several hours without being able to judge of his condition; but it was ascertained that he had been at one time, extremely uneasy, without making any complaints; at another, he suffered pain, and fell immediately again into a state of somnolency. The symptoms increased in intensity towards midnight; he had convulsive movements in the throat; his breathing became painful; he could no longer speak or see, although his eyes were open. A cataplasm composed of several different herbs had been applied to the arm, and a secret antidote had been given him. At two in the morning, he was much better; he had recovered the exercise of his senses; his arm was excessively tumefied. In the course of the day, the symptoms had diminished in a singular manner. He was made to take a few doses of Peruvian bark: the back and palm of the hand, as well as the wrist, were in a state of gangrene; the tendons were laid bare, and there resulted a large ulcer, which was cured by

the ordinary remedies. The patient had recovered his health ten days after, but was not able to use the hand for several months.

OF THE *VIPERA ELEGANS* OF DAUDIN (*COLUBER RUSSELLIANUS*, *KATUKA REKULA PODA* OF THE INDIANS).

Experiment 1st. On the 17th of October, 1787, a fowl was bit in the wing by this reptile. It experienced instantly convulsions, and expired thirty-eight seconds after. The dissection of the body discovered no alterations.

Experiment 2nd. Immediately after, the same animal was made to bite the thigh of a robust dog. Five minutes were scarcely elapsed, when he appeared stupified; the limb was drawn up, and he moved it about frequently, as if it had been in pain. He remained however on his feet, and ate some bread which was offered him; he had one stool. Ten minutes after the bite, the thigh began to be paralyzed, and in five minutes more, it no longer performed its motions: the animal lay down, uttered horrible cries, frequently licked the wound, and made at intervals fruitless efforts to rise. At the end of four minutes, he began again to bark, and moaned frequently; the breathing became difficult, and the jaws were strongly locked together: he then experienced alternately symptoms of agony and stupor, and died twenty-six minutes after the operation. After death, blood flowed from the mouth and nose. The parts in the neighbourhood of the wound were very much inflamed.

Experiment 3rd. The inside of the fore thigh of a rabbit was deprived of the skin, and bitten by the same reptile (which had already bit four other animals). Immediately the thigh was drawn up; nevertheless, the animal attempted to walk. Thirty-five minutes after, he had convulsions, lost the power

of standing, and was affected at intervals with a universal trembling. He died an hour after the bite.

The same reptile bit, the same day, for the sixth time, a fowl, which died at the end of six minutes.

Experiment 4th. On the 13th of March, 1788, a great dog was bit by a *Rekula Poda* which had been shut up for twelve days without eating. One of its teeth accidentally touched the scrotum, and drew blood; the other was slightly applied to the thigh. No symptom made its appearance during the first hour; then the scrotum and genital parts swelled considerably, but the thigh was not drawn up. During the third hour, the animal was plunged into a state of coma; he was no longer able to keep his feet, and the wounded limb was paralyzed. The symptoms went on increasing; the animal lay down in a state of great insensibility; his breathing was painful; but he uttered no cry. Eight hours after, he breathed with the greatest difficulty. This state of languor continued two hours longer, after which, he died without convulsions. The wounded parts were considerably swelled.

Experiment 5th. A horse was bit on the lateral parts of the nose by a *Katuka Rekula*. The bite on the right side was deeper than that on the left. A quarter of an hour after, the right side was slightly tumefied and discoloured; a great quantity of fluid matter flowed from his nostrils. Ten minutes after, the face and throat were very much swelled. Some hay was offered to the animal, which he rejected on account of the impossibility of chewing or swallowing it. Forty minutes after the bite, the lower lip was agitated by convulsive movements, which lasted till night; the eyes were covered with a glutinous matter, and the nose continued to discharge profusely. During the second hour, the horse appeared more affected; the tumefaction increased, principally in the throat and in the lower lip: he refused food; but the breathing was not so difficult, as apparently it ought to have been from the suppression of the discharge which flowed from the nostrils.

The swelling increased during the night. The next morning, the animal was in the same state, unable to eat or drink. Emollient applications were had recourse to, which diminished the tumefaction, and in the evening, he was able to eat. On the third day, the animal could support himself, and was perfectly recovered two days after.

Experiment 6th. An incision was made on the inside of the thigh of a dog who had been bitten with impunity two hours before, by the *Katuka Rekula Poda*. A piece of lint, soaked in the venom of the same reptile, was introduced into the wound. The animal did not experience any remarkable phenomenon; the wound was perfectly healed a few days afterwards. The venom of the serpent nevertheless, preserved its strength, since it produced, in the course of a minute and a quarter, the death of a fowl bitten by it immediately after the incision was made in the thigh of the dog.

Experiment 7th. A hollowed fang made in imitation of the tooth of the serpent, was introduced into the muscles of both thighs of a strong dog, which contained a drop and a half of the venom of two individuals of the species of the *Katuka Rekula Poda*. The dog appeared to lose the use of his limbs; he was dejected, moaned, and lay down: the parts in the neighbourhood of the wounds became swelled; but the next day he was recovered.

Experiment 8th. A piece of lint, soaked in the venom of one of these reptiles, was applied near the groin of a weak dog. The operation was performed after the manner of a seton. In a short time after, the limbs were slightly affected; but the animal was perfectly recovered at the end of a few hours.

The experiment was repeated by diluting the venom with a little rum: the effects were the same.

Experiment 9th. The poison of this reptile was brought in contact with the thighs, the neck, and the breast of several fowls, sometimes by making incisions, sometimes by punctur-

ing them, sometimes by applying lint dipped in the venom. It was also brought in contact with the breast and thighs of several pigeons ; none of these animals experienced any serious symptoms ; but the fowls sometimes died on being punctured two or three different times, by a hollowed fang containing fresh venom, in the different fleshy parts of the pectoral muscles. It was well ascertained, by repeated experiments, that the diversity of effects of this venom did not depend on the thickness which it acquired from the contact of the air. The author of these experiments had been of opinion, for some time, that the symptoms did not take place in some of these animals, because they had lost some blood, and that the poison had been expelled ; but other data caused him to renounce this opinion ; so that he does not attempt to give any explanation of the cause of the difference in the results which he has obtained.

Experiment 10th. The biceps muscles of several fowls were punctured at different times, with a lancet impregnated with the same venom. They died at the end of three or four minutes.

992. It results from these experiments,

1st. That the venom of the *Katuka Rekula Poda*, which is excessively dangerous for dogs when applied by the bite of the animal, is scarcely at all so when introduced by an incision.

2nd. That fowls and pigeons, which uniformly die after the bite of these serpents, sometimes survive the insertion of their venom into an incision ; and even feel but very slight effects from it ; but that nevertheless they may die from the consequences of this artificial insertion, without our being able hitherto, to assign any cause for this difference.

OF THE *COLUBER GRAMINÆUS* OF SHAW
(*RODROO PAM* OF THE INDIANS).

Experiment 1st. On the 14th of October, 1788, the thigh of a fowl was caused to be bitten by this reptile: it was immediately drawn up, and the animal had a stool. Two minutes after, it lay down: it was placed on the feet, and was unable to support itself. Five minutes after the bite, it was agitated by convulsive movements which became very strong, principally in the head and neck; to which succeeded, at the expiration of two minutes, all the symptoms of stupor. Death took place eight minutes from the beginning of the operation. The skin covering the bitten part was dissected, and a black line of about an inch long was observed, which extended towards the groin, and which, on being cut into, furnished blackish blood.

Experiment 2nd. The same day, a pig was bit in the fore foot by the same reptile: the hairs had not been removed. Seven minutes after, the animal was sensibly dejected, and fell into a state of stupor a quarter of an hour after the bite. This state continued to the end of the second hour; the animal was not able to rise, and uttered plaintive cries when placed on his feet. During the third hour, the symptoms appeared to increase; he complained from time to time, and fell quickly again into a state of stupor. These symptoms began to diminish two hours afterwards, and the animal attempted to walk. He was perfectly recovered seven hours after the bite.

Experiment 3rd. Another fowl was bit by the same reptile half an hour after the bite of the pig. It experienced slight convulsions, and died at the end of thirty-three minutes.

Experiment 4th. On the 20th of October, a dog was caused to be bitten by the same reptile. Sixteen minutes after, he had a trembling of the head, and of the anterior extremities. He was placed on the feet, and made a few steps with-

out staggering. Five minutes after, the trembling increased, and the thigh was contracted. Fifty-five minutes after the bite, the trembling was general, and the animal extended his neck; his mouth was directed upwards, and performed the movements of yawning as if he was making efforts to respire; but he uttered no plaintive cries. During the second hour, he lay down on the side, in a state of torpor; but he twisted his limbs at intervals, and had from time to time *subsultus tendinum*. These symptoms diminished after the third hour, and he recovered in a short time. Two days after, he was again bit in both thighs by the same reptile, which had bit in the interval three fowls. The animal experienced the same symptoms, and was recovered in the course of three hours. It was imagined that the venom must have lost its strength after so many bites. In order to be assured of that fact, a fowl was caused to be bitten, which did not die, although it was for two hours under the influence of the poison.

993. These facts go to prove, that the venom of this reptile is not so fatal as that of the *Cobra de Capello*, and of the *Katuka Rekula Poda*.

994. There are beside a great number of species of the same genus *Vipera* which are venomous; we shall here enumerate them.

The *Vipera Chersea* of Linnæus (*Æsping* of Sweden). It inhabits the northern countries of Europe. Linnæus relates, that a woman was bit by this reptile, and died in a very short time. (Amœnit. Acad. Vol. VI. p. 214.) The Viper of *Redi*; the black Viper (*Coluber Præster* of Linnæus); the *Vipera Cleopatra* (*Haje*), *Ammodyte*, *Scythian*, *Cerastes*; the *Vipera Ocellata* of Latreille and Daudin; the *Vipera Lebetina* lance-head, with the head triangular, *Hebraica*, *Atropos*, *Dipsas*, *Severa*, *Stolata*, *Corallina*, *Atrox* (which the Portuguese call *Cobra de Capello*); the white Viper (*Nivea*), *Brasilian*, *Lobéris Tigrina*, *Lactea*, and *Hæmachates*.

OF THE *GÉDI PARAGOODOO* OF THE
INDIANS (*BOA OF RUSSEL*).

Experiment 1st. In the month of August, 1788, a great strong dog was bit in the thigh, near the groin, by one of these serpents, which was kept there for more than twenty seconds; but the skin appeared only to have been scratched: there was seen at the place of the wound only a small quantity of blood, and a little venom. The dog cried out at the moment of the wound, but he walked about freely an instant after. At the end of two minutes, he passed urine; the wounded limb was a little drawn up; however, the animal was able to keep on his feet. Five minutes after, he lay down and barked; the motion of the thigh was sensibly weakened, although the animal could still stand. Twenty-five minutes after the bite, the posterior extremities were paralyzed. In the course of the second hour, the disease made some progress; the animal vomited more than once, became more and more benumbed, lay down on the side, and panted for breath. He died at the end of the second hour, and had scarcely any convulsions. The part bitten was examined four hours after; it was scarcely tumefied or discoloured; which is scarcely ever observed in the bite of other venomous reptiles.

Experiment 2nd. A fowl was bit in the groin by this serpent. A short time after, it fell into a state of stupor; nevertheless, it was able to walk about, and to stand up. At the end of ten minutes, it was no longer able to support itself. Five minutes were scarcely elapsed, when it lay down, and appeared to be asleep. For some minutes, it made, at several different times, fruitless efforts to rise, moving its head from side to side. A short time after, it had slight convulsions, and expired half an hour after having been bitten. The part wounded was not discoloured; but the comb, and the sides of

the mouth were of a dark red colour. The beak and some of the claws were of a livid colour.

Experiment 3rd. A small bitch was bit in the groin by this reptile. At the end of a quarter of an hour, only a slight weakness of the limbs had been perceived. Fifty minutes after, the animal lay down on the side, and appeared to be worse: her posterior extremities, especially that which had been bitten, were paralyzed. An hour after the bite, she vomited, had convulsions for ten minutes, and expired.

OF THE *BUNGARUM PAMAK* OF THE INDIANS, AND *SACKEENE* OF BENGAL (*BOA OF RUSSEL*).

Experiment. A fowl was caused to be bitten by this reptile. The animal shortly after lay down, passed two stools, and was no longer able to stand; it made fruitless efforts to rise during the first ten minutes, and experienced a trembling of the head. Five minutes after, it appeared to be on the point of dying; the convulsions shortly made their appearance, and it died twenty-six minutes after the bite. It is probable that this animal would have died sooner, if the serpent that bit it had been in full vigour.

OBSERVATIONS.

Russel relates beside some observations in which the persons died in consequence of the bites of serpents, the names of which he does not mention.

1st. A man fifty years old, was bit by one of these animals in the small toe of the right foot. He felt at first only a pain similar to what a large ant would have produced, and went and lay down. Eighteen hours after, he was found almost stiff, and said that death appeared to him inevitable; he did not suffer much pain, but was in a state of stupefaction; he lost the faculty of seeing, and expired two hours after.

2nd. The same serpent bit, nearly at the same time, the inside of the left wrist of a soldier. This man experienced little pain, but fell into a state of drowsiness, and lay down to sleep. He was woke eighteen hours after; he laboured under a dimness of sight, and was recommended to walk about. On examining the wrist three hours after, two small punctures were perceived at the distance of the eighth of an inch one from the other. Two hours afterwards, he could no longer see, and complained principally of being hindered from sleep. He lay down, and expired an hour and half after, without having had any convulsions. The bodies of these two persons began to putrefy four hours after death. The Indians give the name of *Min Naig Paum* to the serpent which was the cause of these accidents.

3rd. A young servant girl, terrified by some antecedent circumstance, was bit by a serpent. She complained loudly, and was utterly incapable of giving any account, a few moments after, of what had happened to her: she expired at the end of ten minutes.

The following are the conclusions drawn by this enlightened traveller, *Russel*, from the preceding facts:

1st. The different reptiles mentioned above, are all venomous, but in different degrees.

2nd. The symptoms produced by them in the different animals are nearly alike, appear nearly in the same order, but with greater or less rapidity: in general, their invasion takes place from the third to the tenth minute; they rarely exceed half an hour.

3rd. When the reptile has been lately caught, its bite is more deleterious than when it has been kept some time; nevertheless, it does not lose entirely its poisonous qualities, even when kept shut up without food. In this case, if it has not the strength necessary to kill a quadruped somewhat robust, it preserves the faculty of destroying fowls, pigeons, &c.; though indeed, with less energy than if it had been recently caught.

4th. When the same reptile is made to bite several times in the same day, the first is always the most deleterious, every thing else being equal.

5th. The poison of these reptiles does not always kill animals: there are even some that recover after having been a prey to fatal symptoms. In general, the danger they incur, is in proportion to the intensity, and the speedy appearance of these symptoms.

6th. The period of death varies considerably. Dogs do not die so speedily as birds: this difference does not appear to depend on the size of the animals.

7th. There is much less certainty of producing the symptoms of poisoning, by applying the venom to an incised part, than in causing the animals to be bit by the serpent, but, in those cases where they do take place, they are identically the same, and equally fatal to small animals.

OF RATTLE-SNAKES.

995. These serpents constitute a genus, known under the name of *Crotalus*, in which are reckoned eight species, viz. the *Crotalus Boiquira*, the black-tailed *Crotalus*, the *Crotalus Durissus*, the lozenged *Crotalus*, the *Crotalus Dryinas*, the *Crotalus* without spots, the flat-nosed *Crotalus*, and the millet *Crotalus*.

Characters of the Genus. The superior jaw exhibits one, and sometimes two enormous fangs, or teeth of greater strength, frequently six lines and more in length, and contained in a sort of bag or membranous sheath, from which they start out when the animal raises them. It is here, under the skin, which covers the jaws, that the poison bags are placed. It insinuates itself into the fang, and issues out by a longitudinal slit, which is seen on the inner side, a small distance from the point. Transverse marks, or bands, underneath the body, and

underneath the tail, which is terminated by one or several hollow pieces of a shelly consistence, and sonorous. (*Bosc.*)

It is well known how much the history of these serpents abounds in fabulous recitals, to which we do not wish to recall the attention of the reader; our object here, is not to reproduce all that has been written of the marvellous concerning the instinct, habits, and other particulars relating to these reptiles: these details are the province of Natural History and Physiology: we shall therefore confine ourselves to the proving, that the bite of these serpents is extremely dangerous, and point out the principal symptoms produced by it.

OBSERVATION.

Thomas Soper, twenty-six years of age, of a weak constitution, was bit on the 17th of October, at half past two o'clock, twice in succession, on the first phalanx of the thumb, and twice on the side of the second joint of the fore-finger, by a Rattle-Snake of four or five feet long. A doze of jalap was administered to him very soon after, and some drugs were applied to the wound: the hand swelled up, and the patient, greatly terrified, was admitted to St. George's Hospital at three o'clock. The wristband of his shirt had been opened, and the swelling extended half way up the fore-arm: the skin of the back of the hand was very tense, and extremely painful. At four, the tumefaction had extended to the elbow; and, at half past four, half of the arm was already swelled; the pain extended to the axilla. *M. Brodie*, who first visited the patient, discovered that the skin was cold; the pulse was beating a hundred strokes in the minute; his answers were incoherent, and he had an inclination to vomit. Forty drops of pure fluid ammonia, and thirty drops of sulphuric ether, in an ounce of camphor mixture, were administered to him; the patient immediately vomited this draught; pure ammonia was applied to the wound, and upon the arm and fore-arm were applied

compresses, moistened with camphorated spirit of wine. At five, he took two drachms of the compound spirit of ammonia, thirty drops of ether, and an ounce and half of camphor mixture; this draught was not vomited. At six, the pulse was stronger: he was very weak at half past seven (*thirty drops of ether, and the same quantity of ammonia in water*). This dose was repeated at half past eight. At nine, he felt himself sinking greatly. The skin was cold, the pulse, which was feeble, beat only eighty strokes in the minute. The same medicines were again given to fifty drops, and were afterwards repeated. At a quarter past ten, the pain of the arm was extremely acute, the pulse stronger; but the patient fell into a fainting fit every quarter of an hour. In this state, the pulse became imperceptible; but, during the intervals, his mind was not extremely depressed. He had two stools in the evening. *M. Everard Home* saw him for the first time at half past eleven. The hand, wrist, fore-arm, arm, shoulder, and axilla, were excessively tumefied; the arm was almost cold, and it was impossible to perceive the pulsations in any part of it, without even excepting the site of the axillary artery: the wounds of the thumb were not very visible; those of the fore-finger were remarkably apparent: the skin was extremely cold. They endeavoured to tranquillize him with respect to his situation, and he said, that he hoped to recover. On the 18th, at one in the morning, he spoke in a confused manner; his pulse beat a hundred strokes in the minute; the faintings were frequent. The same medicines were given him every hour. At eight in the morning, his pulse was extremely weak, and beat a hundred and thirty-two strokes in the minute. The swelling had not gained upon the neck; but there was a fulness along the side; the blood was extravasated under the skin as far as the lumbar region, which gave to the right side of the back a party-coloured appearance; the whole of the arm and hand was cold and painful on pressure; the skin was extremely tense; there were pustules on the inside of the arm,

below the axilla, and near the elbow; above each pustule, the skin exhibited a red spot, the size of a crown piece; it had in general recovered its heat; the patient was extremely weak and dejected; his lips trembled, and the fainting fits were renewed nearly in the same manner as in the preceding evening. The last dose of the medicine had been thrown up; but he kept on the stomach some hot wine, which had been given him at noon. He had some convulsive movements in the limbs; the whole skin of the arm appeared livid, similar to that of dead bodies which begin to putrefy; there was a fluctuation below the skin of the external part of the wrist and fore-arm, which determined the medical attendants to puncture it with a lancet; there flowed out a small quantity of serous fluid. The same medicines were continued till eleven at night; but perceiving that they were frequently vomited, he was ordered two grains of opium every four hours. The pulse was scarcely perceptible at the wrist; the faintings were not less frequent; the pustules and spots had increased in size.

19th *October*. At nine in the morning, his pulse was hardly perceptible, the extremities cold, the pustules increased in size, and the arm diminished in bulk. He was extremely drowsy, which probably was the consequence of the opium. He had taken nothing during the night but brandy. At three in the afternoon, he was still more sunk, and spoke very slow; the pustules were still larger; the faintings less frequent; the size of the arm was diminished, and he recovered the sensation in the fingers. At eleven in the evening, his pulse beat a hundred and thirty times in the minute, and was small. The opium was suspended, and he was evacuated by means of a glyster. He was ordered beside, for his drink, camphor mixture, brandy, and wine.

20th *October*. He had been very drowsy at intervals during the night; his intellectual faculties were in a better state, and his extremities warmer. At nine, he took some coffee for breakfast; some little time after, he ate some fish which he

threw up again. He then took nothing else but brandy and coffee in the dose of half an ounce at a time, because they were always vomited when taken in larger quantities.

21st *October*. He slept from time to time during the night; but had some delirium; his pulse beat a hundred and twenty in the minute; his stomach was not able to retain any thing but brandy and jelly. The size of the arm was sensibly diminished; but the skin was extremely tense.

22nd *October*. He had slept almost the whole night; his pulse beat ninety in the minute. He ate some veal for dinner, and took a little brandy; the pulse became strong and full in the evening; wine was substituted for the brandy. The right side of the back was inflamed and painful towards the lumbar region, and had a party-coloured appearance, on account of the extravasated blood under the skin.

23rd *October*. The pulse continued full, and the arm extremely painful, although diminished in size; the abscesses had burst, and the skin was dressed with white ointment; some evacuations were procured by means of an aperient drink. He took some veal and porter for dinner: the wine was suspended. In the evening, a saline preparation was ordered for him, with antimoniated wine.

The next day, no alteration.

25th *October*. The frequency of the pulse was increased: he was evacuated.

26th *October*. The arm was more swelled and inflamed.

27th *October*. This inflammatory state had increased; the tongue was foul, and the pulse very frequent. He attempted to get up; but could not accomplish it, on account of the weight and pain of the arm. Spirit of wine and acetate of ammonia were applied to the arm.

28th *October*. The slough had begun to separate on the inner side of the arm, below the axilla, and diarrhoea had already taken place. A chalk mixture with laudanum was ordered for him. He had cold shivering during the night.

29th *October*. The diarrhoea was diminished: the pulse was weak, and beat a hundred in the minute. A large abscess was formed on the exterior part of the elbow; it was opened, and a quart (*chopine*) of a brownish red matter was discharged from it, in which floated some sloughs of the cellular texture. The inferior part of the arm became small, but the tension continued in the upper part: a poultice was applied over the wound. The lower part of the arm and the fore-arm was covered with circular straps of cerate. The bark was ordered for him, and he was allowed the use of wine and porter.

30th *October*. The redness and tumefaction of the superior part of the arm were diminished; the pulse beat a hundred in the minute. The patient had been again purged. The bark was suspended; he was made to take the calcareous mixture, with laudanum, and an opiated glyster.

31st *October*. The pulse beat a hundred and twenty in the minute; the suppuration of the abscess was diminished; the patient continued to be purged, and had a cold shivering in the night.

1st *November*. Pulse a hundred and twenty in the minute; voice feeble; he had no appetite, and was delirious from time to time. The ulcer was very extensive, he drank two pints of porter in the course of the day.

2nd *November*. Pulse extremely feeble, countenance sunk, tongue brown, the ulceration was of two or three inches in extent: the skin in the neighbourhood of the axilla was gangrened; he vomited every thing except the porter; the delirium continued the whole of the night.

He died on the fourth of November at half past four in the afternoon. The body was opened sixteen hours after, there was no visible external lesion, except in the arm that had been bitten: the skin was white, and the muscles contracted. The wounds inflicted on the base of the thumb were cicatrized, but the puncture of the wrist was still open: the skin was in a state of gangrene throughout a great part of

the arm and fore-arm; it was still adhering to the flexor muscles of the fore-arm, by means of a portion of cellular texture, which was of a dark colour. In the other parts of the arm, fore-arm, and axilla, it was separated from the muscles by means of a dark coloured fluid, of a fetid smell, in which were swimming some sloughs formed by the cellular texture; the muscles were in their natural state, except near the abscess; the lungs did not appear to be altered; the surface of the pericardium corresponding to the sternum was dry; there was in the cavity formed by this membrane, half an ounce of a serous fluid, mixed with some bubbles of air; the blood contained in the ventricles of the heart was coagulated; the cardiac portion of the stomach was a little distended by a fluid; that which corresponds with the pylorus was very much contracted; the vessels of the mucous membrane of this viscus were exceedingly dilated by blood. The intestines exhibited no alteration; the gall-bladder contained a great quantity of bile, which appeared not to be altered. The lacteal vessels and thoracic duct were empty, and in their natural state; the vessels of the *pia mater* and brain were distended with blood; the ventricles of this organ contained a greater quantity of serosity, than in their natural state; there was also an effusion into the cells, which unite the *pia mater* to the arachnoid membrane. This alteration of the brain and its membranes, is frequently met with in acute diseases which have proved fatal.*

M. Everard Home, who has collected a number of facts relating to the bite of different venomous serpents, is of opinion, 1st. That when the venom is extremely active, the local irritation is so sudden and violent, and its effects on the animal economy so severe, that the animals die in a very short space of time: in that case no alteration is found except in the parts bitten: the cellular texture is entirely destroyed, and

* Philosophical Transact. for the year 1810, part 1st, p. 75. Read December 21st, 1809, by *Everard Home*, Esq.

the muscles are very much inflamed; 2nd. That when the poison is less intense, its action is not always fatal; nevertheless there is a slight delirium, and considerable pain in the part bitten. About half an hour after, a swelling takes place, which depends on the effusion of serosity into the cellular texture, which continues to increase with greater or less rapidity for about twelve hours, and which extends into the neighbourhood of the affected parts; the blood ceases to flow in the smaller vessels of the parts that are tumefied; the skin which covers them grows cold; the action of the heart is so feeble, that the pulse can scarcely be felt; the stomach becomes so irritable, that it can scarcely retain any thing. About sixty hours after, these symptoms have acquired a greater degree of intensity; inflammation and suppuration take place in the injured parts; and, when the abscess is very considerable, the patient expires. When the bite has been inflicted on the finger, this part sometimes becomes gangrenous immediately. If death happens under one of these circumstances, the absorbent vessels and their glands do not experience changes similar to those produced by the *virus*, and there is no alteration except in the parts which have some connexion with the abscess. In general, the symptoms which take place in these cases proceed more rapidly than those which depend on a *virus*. This consideration, joined with the grievousness of the symptoms which take place at first in those persons that recover after having been bit, has induced the opinion that their cure was attributable to the medicines employed; it is for this reason, for instance, that the *eau de luce* is regarded in the East Indies, as a specific against the bite of the *Cobra de Capello*. 3rd. That this opinion appears to have no foundation; for death takes place whenever the poison is very active, and every time it produces a very extensive local injury; whilst recovery attends all slight wounds. The effects of the venom on the constitution are so instantaneous, and the irritability of the stomach so great, that it is

not possible to administer any medicines until the symptoms are fully developed, and then there is little chance of success.*

OF INSECTS.

OF THE SCORPION.

996. The sting of the Scorpion produces on the human species, symptoms which vary according to the size of the animal, and the climate to which it belongs: in general, it is much more dangerous in southern countries than in others.

1st. *Bontius* affirms, that the great Scorpion of the Indies produces madness in such persons as are stung by it.

2nd. *Mallet de Brossiere* saw at Tunis two persons, who, having been stung by a great Scorpion, experienced very grievous symptoms, which yielded only to the employment of the volatile alkali. (*Société Royale de Médecine*, tom ii. p. 315.)

3rd. An adult man, of Montpellier, was stung by a Scorpion at the bottom of the left thigh. He was at first less sensible to this sting than to that of a bee. The next day he experienced great tension, with sensibility up to the middle of the thigh, attended with an erysipelatous redness. The place of the sting was of a deeper red, bordering on black, from four to five lines in diameter, and without any regular form. There was no effusion of blood; the symptoms continued six or seven days, and disappeared of their own accord, without having had recourse to any other application than that of saliva. The brown spot remained about a fortnight. (*Notice des Insectes de la France réputés venimeux*, par Amoureux, 1789, p. 199.)

* Philosophical Transactions for the year 1811, by Everard Home, part i. p. 75.

4th. The celebrated *Maupertuis*, who made a great number of experiments on this subject, has proved that the sting of the Scorpions of Languedoc may prove fatal, but that it happens very rarely. Out of a very great number of dogs and fowls, bit by these insects, there only died one dog, who had received under the belly three or four stings from an irritated Scorpion. He became very much swelled an hour after having been stung; he staggered, vomited all that was contained in the *primæ viæ*, fell into convulsions, bit the ground, dragged himself along on his paws, and expired at the expiration of five hours. (*Academie des Sciences*, année 1731.)

5th. *Matthiolus* asserts that the Scorpions are venomous in Etruria, that they are less so in the rest of Italy, and not at all so in the territory of Trent.

M. Amoureux, who has written an excellent work on venomous insects, after having collected various observations of stinging by Scorpions, is of opinion, that the symptoms which they most frequently occasion may be reduced to the following: a red mark which increases a little, and grows slightly black towards the centre, and which is commonly followed by pains, inflammation more or less considerable, swelling, and sometimes pustules; some persons experience fever, cold shiverings, and numbness: vomitings have sometimes been observed, and singultus; pains all over the body, and tremblings.

OF SPIDERS.

997. If credit is to be given to the writings of *Turner*, *Lister*, *Scaliger*, *Flacourt*, *Brogiani*, and others, Spiders ought to be ranked amongst the most venomous of animals; on the other side, *Hoffman*, *Bon*, *Robert*, *Boyle* contend that there is nothing hurtful in them, and that they may be swallowed with impunity. *M. Amoureux* assures us that the sting of the large Spiders of France is little apparent; that there forms round the part punctured a swelling of a livid colour,

sometimes with *phlyctenæ*, which seem to indicate a septic venom. He is of opinion that the other grievous symptoms described by authors are infinitely exaggerated.

OF THE TARANTULA.

998. This insect has been the subject of a multitude of fabulous recitals, engendered by ignorance and superstition. Nevertheless some respectable authors, amongst whom we shall notice *Baglivi*, have written at length on the effects it produces. We read, in some amongst them, that the bite of the Tarantula is capable of producing a slow fever, of which the patient cannot be cured but by dancing beyond his strength, to the sound of a drum or some sonorous instrument; on which account, unfortunate wretches have been seen, all decorated with flowers and ribbons, like victims, traversing the public places in the hottest part of the day, dancing bare-headed, with their faces turned towards the sun, until the total exhaustion of their strength plunges them into a state of profound lethargy: then their relations carry them off on a couch, and the music is continued a long time after they have ceased to hear it. Other authors pretend to have seen all the symptoms of *ataxic* fever discover themselves, in consequence of the bite of this insect.

M. Serrao, Chief Physician to the King of Naples, has undeceived the public, already too long abused by the appearances of the marvellous. A man allowed himself to be bitten by a Tarantula, in presence of the Polish Count de Borch; there followed only a little tumefaction in the hand and fingers, and a tolerably strong itching. (*Amoureux.*) *M. Pulli* has ascertained that the *Tarentism* is frequently a feigned disease; such is the case with respect to that woman, rendered fanatic by a superstitious ecclesiastic, and who could only be cured by dint of threats and ill treatment. (ALIBERT, *Elements de Therapeutique*, tom. ii. p. 506, 3rd Edit.)

Epiphanius Ferdinand declared in 1621, that during the twenty years he had practised medicine at Naples, he had never seen any one die of the sting of the Tarantula; but he maintained the opinion that Tarentism was not a feigned disease.

The opinion of the enlightened is, that the sting of the Tarantula does not produce any extraordinary phenomenon, and that its effects are rather local than general. Nevertheless, it is much to be wished that a regular series of experiments on this subject should be set on foot.

OF THE BEE AND THE HUMBLE-BEE.

999. Every one knows the dangers arising from the sting of certain Bees. The few facts detailed below, may serve to make known the symptoms to which they give rise.

1st. A peasant about thirty years of age was stung by a Bee a little above the eyebrow; he fell instantly to the ground, and died a few moments after. His face was inflamed, and a very profuse hæmorrhage from the nose took place after death.*

2nd. *Zacutus* has seen the sting of a Bee followed by gangrene of the part,

3rd. *M. Amoreux* says, "the sting of a Bee is nothing of itself; but if these insects should assail either a man or an animal, in a swarm, they may cover him with wounds and destroy him, as well by the quantity of venom they introduce into his body, as by lacerating him."†

4th. *Swammerdam* and *Ludowic* tasted a little of the venomous fluid contained in the vesicle of the Bee, and they experienced on the skin and on the tongue the same sensation as is produced by aqua fortis (*Nitric Acid*).

In general the sting of the Bee is followed by a severe pain,

* *Observation de M. Debrest, Journal de Médecine, Août, 1765, p. 153.*

† *Op. Citato, p. 248.*

and an erysipelatous tumefaction, very hard in the middle, which looks white, and continues as long as the sting remains in the wound.

OF THE HUMBLE-BEE.

M. Amoureux asserts that this insect is more to be feared than the Bee. In 1679, several persons in Poland were stung by large Humble-Bees, and there took place in them an inflammatory tumor which made a rapid progress, and which could only be stopped by making deep scarifications.

OF THE WASP AND HORNET.

1000. The sting of Wasps may also become fatal.

1st. A gardener of Nancy having put into his mouth an apple, in which was enclosed a Wasp, he was bit by it in the palate, near the *velum palati*, which produced a sudden inflammation and painful swelling, which, having intercepted the respiration, put a period to the unfortunate man's existence in the course of a few hours.*

2nd. *Lanzonus* speaks of a woman who was stung by a Wasp on the cheek, and who had an ulcer for three months in consequence of it.†

3rd. An English land-surveyor, says *M. Chaumeton*, had the satisfaction of saving the life of one of his friends, who was stung in the œsophagus by a Wasp, which he had not perceived in a glass of beer. He caused him to swallow, at several different times, common salt (muriate of soda) diluted with as small a quantity of water as possible, so as to form a kind of broth: the alarming symptoms, which had begun to

* *Gazette de Santé*, No. 45, p. 185. ann. 1776.

† Observation 188, tom. ii. Opera.

take place at the beginning of the accident, subsided almost at once, and disappeared as if by enchantment.*

M. Amoureux is of opinion, that the sting of Wasps and Hornets does not differ essentially from that of Bees and of Humble-Bees.

Those of Wasps, he says, are much more sharp, and those of Hornets terrible. They are more or less severe, according to the part affected ; according as the venom is in greater or less abundance ; according as the insects are enraged or animated by the heat of the season and climate ; lastly, when they have rested on venomous plants, on the bodies of animals that have died of pestilential diseases, and during contagious constitutions of the atmosphere. (*Op. Citat.* p. 250.)

5th. The celebrated *Reaumur*, in a very excellent paper on Wasps (*Académie des Sciences*, ann. 1719), assures us, “ that when a person allows himself to be stung peaceably, the sting never remains in the wound. It is flexible ; it does not make a very straight wound ; the wound is curved, or in a zig-zag direction. If the wasp be forced to retire hastily, the frictions are strong enough to retain the sting, which is in some measure barbed ; they tear it out from the animal ; if, on the contrary, the insect be not hurried, it disengages it by degrees. The stings of the Hornet-Wasps are more sensible than those of the smaller kind.”

1001. We might treat of other insects, the stings of which occasion symptoms similar to those we have just described ; but we shall confine ourselves to the enumeration of them : the gnat, the gad-fly, the *mouche a scie*, the ichneumon, the tick, the *oestri*, the *scolopendra*, &c. &c.

* *Dictionnaire des Sciences Médicales*, article *Abeille*.

OF ANIMALS THAT PRODUCE GRIEVOUS SYMPTOMS BY THEIR INGESTION.

1002. This section comprises particularly certain species of fish, and muscles. There is in the Edinburgh Journal a paper of Dr. Chisholm on the poison of these fishes, from which we shall extract the principal results.*

CLUPÉ CAILLEUX-TASSART (CLUPÆA TRHYSSA OF LIN. YELLOW BILL OF THE ENGLISH).

1003. A negro of the dominions of the Great Mogul ate some of this fish: he had scarcely swallowed it, when he experienced horrible convulsions, and died half an hour after. The œsophagus and stomach were very much inflamed.

When the action of this fish is less violent, it produces an itching over the whole body, terrible gripings, a constriction and heat of the œsophagus, nauseas, great heat of the skin, acceleration of the pulse, vertigoes, loss of sight, cold sweats, insensibility, and death. The action of this fish is so rapid, that it has been often seen at *St. Eustatia* that persons have expired while still eating it. It appears, however, that its poisonous qualities depend greatly on the climate, since it is eaten with impunity at *Porto-Rico*.†

CORACINUS FUSCUS MAJOR (GRAY SNAPPER OF THE ENGLISH).

1004. This fish acts principally on the intestines, and produces a *cholera morbus* accompanied with horrible pains; it

* Edinburgh Medical and Surgical Journal, 1st October, 1803. Tom. iv.

† Some other cause for this difference must be looked for than the climate; the two islands of *St. Eustatia* and *Porto-Rico* being almost in sight of one another, and nearly in the same degree of latitude.—TRANSLATOR.

produces likewise an itching on the surface of the body, the denudation of which it sometimes, though very rarely, effects, and the epidermis falls off as in certain species of leprosy. Its effects continue for a very long time, and there results from them a chronic disease distinguished by a great debility, and a paralysis of the inferior extremities, dimness of sight, and hardness of hearing.

Several persons ate of this fish in 1786, and experienced the symptoms above mentioned; one of them exhibited very remarkable phenomena. This man had, for two years, an ulcer in the leg, which had resisted all the curative means employed about it: at the moment he ate the fish of which we are giving the history, it was decided to amputate the limb, an operation which was considered indispensable for the preservation of the patient. A few moments after having eaten the fish, he experienced the symptoms we have described; but at the end of two days, the suppuration became more abundant, the discharge was thick, and of a better colour; the whole surface of the skin was covered with spots, which became holes, and discharged copiously a substance of a white colour, thick, and as it were curdled. This secretion did not cease till the end of six weeks; after which, the ulcer proceeded towards a cure, and the patient was entirely recovered a few weeks after, without any other means being employed.

The *Sparus Pargos* of Forster (*Porgee* of the English) produces effects similar to that of the *Coracinus*; but they are much less in the West Indies.

(*CORYPHÆNA CÆRULEO VARIE SPLENDENS*, *CAUDA BIFURCA*; *CORYPHÆNA HYPPURUS* OF LACÉPÈDE) DOLPHIN OF THE ENGLISH.

1005. *M. Chisholm* asserts, that this fish produced in an inhabitant of the island of Grenada, a violent head-ache,

nauseas, an eruption of broad spots, of a vermillion colour, an intolerable itching, and a tightness of the chest : these symptoms yielded to a simple treatment.

(*MURÆNA MAJOR SUBOLIVACEA*) CONGER
EEL OF THE ENGLISH.

1006. In the month of April, 1791, several persons of the Island of Grenada ate of this fish. The following night, they experienced gripings, *cholera morbus*, a peculiar sensation in the lower extremities, which might be designated by the name of *convulsive twitches*. A child, who had also eaten of it, experienced faintings. The negroes suffered more than the whites ; they all experienced a coppery taste in the mouth, and a sensation in the œsophagus, as if it had been excoriated. These symptoms, in the negroes, continued a fortnight, and terminated by a paralysis in the inferior extremities. One of these persons had a general paralysis of the whole side. In the child, a very extensive eruption broke out on the hairy scalp, which exhaled a very disagreeable smell. They were all restored to health after several months' sufferings.

(*SCOMBER MAXIMUS*,) KING-FISH OF THE
ENGLISH.

1007. This fish, especially the variety known by the name *Bastard King-Fish*, has produced sometimes *cholera morbus*, and an eruption of a red colour.

OF MUSCLES.

1008. It is perfectly ascertained that many persons have experienced serious symptoms after eating Muscles : these symptoms have sometimes been followed by death. This truth will be placed beyond a doubt by the following facts.

OBSERVATIONS.

1st. *Mademoiselle ****, aged sixteen years, of a very good constitution, and who was not at that moment at a critical period, ate five or six Muscles that had just been cooked, but had not been seasoned. She experienced immediately after, a very violent suffocation, which continued increasing: her face was swelled, the whole body covered with white patches, very large and very prominent; the patient experienced great agony, perspired a little, and had a painful shedding of tears. A few cups of sugared water were administered to her, and some time after, she was made to take, by spoonfuls, two drachms of ether in two ounces of peppermint water. The first doses of this mixture were scarcely swallowed, when the pustules subsided, and the other symptoms disappeared. A few cups of an infusion of orange leaves easily put an end to the fatigue and agitation which had been the consequence of this indisposition. A slight cold with which this young lady was affected before the accident, was found to be entirely dissipated. The father of this young person experienced no inconvenience after eating a great quantity of these Muscles.

M. de Montegre, from whom we have borrowed this observation, mentions, that a similar event had recently occurred in his own neighbourhood.*

2nd. *Dr. Charlet* reports the following fact: "Madame G., aged forty years, of a sanguineous lymphatic temperament, was enjoying perfect health. She ate some Muscles for her dinner. Two hours afterwards, being at the play, she took a few pieces of orange, and experienced immediately irregular shiverings, a pain in the epigastrium, with oppression and difficulty of breathing, general uneasiness: the face became red and swelled; the suffocation continued increasing to such a degree, that the patient was not able to lie down on

* *Gazette de Santé*, 1st Mars, 1812, p. 51.

returning to her own house. To these symptoms were united very violent itchings, and a sudden and intense discharge of mucus from the nose. *M. Charlet* prescribed sinapisms to the legs, and a warm fumigation, into which was put, at different times, three drachms of sulphuric ether, the vapours of which were directed into the mouth and nostrils by means of a funnel. In a short time the face became pale, and the other symptoms subsided. At the end of a quarter of an hour, the patient fell asleep, and complained only of a slight fatigue the two following days. (*Gazette de Santé*, du 21 Mars, 1813.)

There may be seen, moreover, in the Number for the 11th April, of the same Journal, two instances of this kind of poisoning; one of which was cured by *M. Dentangeon*, and the other by an apothecary.

3rd. " On the 18th of September last, Madame***, thirty years of age, of a delicate state of health, but at that time very well, ate at her dinner, among other things, about ten Muscles, forming part of a dish of that kind of shell-fish which was prepared as sauce to a fowl. About an hour after the meal, she experienced a difficulty of breathing, slight pain of the head, frequent sneezings, expectoration, and copious secretion of mucus from the nostrils, and in appearance all the symptoms of a violent cold which had advanced with extreme rapidity. In a short time, all the symptoms increasing, the chest became loaded, and the breathing was sterterous: then the upper eye-lids only began to swell, a very severe itching was felt all over the body, and there appeared on some parts, especially on the shoulders, a vesicular eruption similar to that of the stinging of nettles. The difficulty of breathing did not cease to increase, and the tumefaction of the superior eye-lids was increasing visibly to the eye. At the end of ten minutes, the eruption disappeared, and convulsive spasms seized the breast, in such a manner as to threaten instant suffocation. It is remarkable that the impediment of the respi-

ration took place particularly in the movement of expiration which was performed in a convulsive manner, and with excruciating pains. The agony, which continued every moment increasing, was so great, an hour after the invasion of the symptoms, that the patient, ready to expire, seized violently upon every thing that surrounded her, to seek some relief. *Dr. Dulong* administered a very strong dose of ether. At the same moment, all the symptoms subsided as if by enchantment; the tumefaction of the superior palpebræ, which remained, went on increasing till evening, to such a degree as to intercept vision. The inferior lids did not swell till next day, and three or four days after, the patient exhibited no other symptom than a notable leanness.”*

There were neither vomitings nor indigestion in the person who forms the subject of this observation; she was not at the period of her menstrual evacuations.

4th. *Professor Fodéré* mentions, in his work on Medical Jurisprudence, having opened the body of a man who had died two days after having eaten Muscles, and that he had experienced nausea, vomitings, and tenesmus; his pulse had been small, tight, and hurried; the stomach and intestines were slightly inflamed; there were also lesions in some of the other organs; but they were depending on antecedent diseases.†

5th. Two children, one nine years of age, the other fourteen, ate, on the 1st July, 1814, some Muscles, which were putrid. The next day, they vomited. The day after, they experienced a great difficulty of breathing, gripings, intense thirst; the abdomen and face swelled up; the skin was covered with an eruption as it were from nettles, accompanied by an intolerable itching; they continued to vomit fluid matter, of a dark green colour. The youngest of them was delirious, and sunk into a state of coma; convulsive contorsions took place all over the body, and continued till the following day, when

* *Gazette de Santé*, 1er Octobre, 1812.

† Tome iv. p. 85.

he died. On the 4th July, the eldest exhibited distressing symptoms; his face was of a pale ash colour, the pupils very much dilated, the breathing difficult; he had an unquenchable thirst, nausea, and gripings; the extremities were cold; the pulse frequent and small; there was *subsultus tendinum*. Evacuants were administered in vain: he died a few hours after. There were scarcely any alvine evacuations in these two cases.*

6th. Captain Vancouver, in his voyage to the coast of America, mentions, having seen one of his men die in a state of coma after having eaten Muscles. Two others of the ship's company, who had partaken of the same, recovered after several days, by means of a great quantity of warm water, which excited vomiting.†

1009. What is the cause of the symptoms produced by Muscles and other poisonous fish? Several different opinions have been advanced on this subject.

1st. It has been pretended, that it depended on a morbid alteration of these *Molluscæ*, and, in this case, the poison has been made to reside, sometimes in every part of the animal, sometimes in one of its organs. *M. Burrows*, in his excellent paper on poisonous fish (*just quoted*) has collected a multitude of curious facts, which attest, on the authority of *Quieros*, *Forster*, *Thomas*, *Chisholm*, *Quarrier*, &c., that certain fish when fresh, had been eaten without inconvenience, and which had no appearance of disease; but that the next day these same fish were extremely poisonous, although they had been salted. He is of opinion, in consequence, that their deleterious effects ought to be attributed to a peculiar alteration of the fluids secreted, and of the functions of these animals; an alteration which disposes them in a singular manner to a speedy putrefaction. Their poison, says he, is more

* An Account of Two Cases of Death from eating Muscles, by George Mann Burrows. London, 1815.

† VANCOUVER's Voyage of Discovery, vol. ii. p. 286.

active after the annihilation of the vital powers. He besides combats successfully the opinion of those who make the poison to reside in one part only of the animal, as the skin, stomach, intestinal canal, gall bladder, and liver.

2nd. It has been believed, that the poisonous properties of these Molluscæ and poisonous fish, depended essentially on the substances they happen to feed on. Thus they have accused in turns, the Manchineel (*Hippomane Mancinella*) narcotic marine plants, such as the *Corrallina Opuntia*, crabs, small marine stars, the spawn which these animals contain at certain periods, green copperas (sulphate of iron), the preparations of copper, those of barytes, &c. &c. *James Clarke*, *Chisholm* and *Beunie* have principally supported these opinions. *M. Burrows* affirms, with reason, that the first of these hypotheses are totally destitute of foundation; that there are no facts to support them; and he consequently confines himself to the examination of those which make the deleterious properties to reside in some mineral substance. 1st. The sulphate of iron, he observes, is a substance too little hurtful to be regarded as the cause of the symptoms produced by these animals. 2nd. As to the preparations of copper, how can we conceive their introduction into these Molluscæ? without doubt after their solution in water. Now, the analysis of seawater made in different places, has never discovered one atom of this metal. Beside, would not these animals themselves be killed after the ingestion of a preparation of copper? * And how many times have we not seen fish caught in the ocean produce the same symptoms as those caught in shoal waters, near the land, where not an atom of copper could be discovered?

3rd. It has been thought also, that the action of Muscles

* It is far from being understood here, that the animals which attach themselves to the copper which covers the bottoms of ships, and which contain a quantity of vert-de-gris, are not hurtful, in consequence of the quantity of poison which is applied to their surface.

depends on a peculiar disposition of the stomach (idiosyncrasy) : such is the opinion of many respectable men of science.

Our friend *Dr. Edwards*, a physician of very distinguished abilities, is in possession of a number of remarkable observations on this subject, which he has been so good as to communicate to us, and which appear to us to be deserving our attention.

1st. A person who otherwise enjoys a good state of health, and who had always experienced indigestions every time he ate gudgeons, ate of a pye in which there were balls made principally of the flesh of the gudgeon : he found them excellent without knowing what he had eaten : but, two or three hours afterwards, he experienced an uneasiness at the stomach, nausea followed by vomiting, and some other symptoms. The constancy of the hurtful effects of this food obliged him to renounce it. This peculiar aversion of the stomach without the taste having any share therein, may arise unexpectedly for a kind of food which has been constantly used before without any kind of inconvenience.

2nd *Madame S.* had always eaten trout without any kind of inconvenience ; nothing had sensibly affected her health, when she was all at once struck with a strong indigestion followed by vomiting, after having eaten this fish at dinner. She could only attribute it to the existing state of the stomach, which was not able on that day to bear so wholesome a food : but since that time, the smallest quantity has constantly been sufficient to produce an indigestion, accompanied by nausea and vomiting. Not considering the affinity existing between this fish and salmon, she thought she should be able to eat that as before ; but she experienced from it the same effects as from trout.

3rd. A young man, who was somewhat debilitated by a debauch, suspecting that his mother, who was a widow, had the intention of marrying again, was deeply affected by it. One day, when he was dining with the person who was privately become his father-in-law, and who was the object of

his hatred, he experienced a very strong emotion during the whole time of the dinner. He ate some muscles, which under other circumstances, had never done him any harm, but which, in the present case, occasioned him an uneasiness at the stomach; and some time after, he had a strong attack of a nervous affection, which put on the appearance of epilepsy: he stretched out his limbs, twisted his arms, his mouth was foaming, and his eyes fixed. This state continued for several hours, it was repeated eight or ten times during the space of several weeks, without, however, proceeding further, or having any unfortunate termination.

4th. Amongst the persons that have been indisposed from eating Muscles, several have been so at different times; at one time, they have taken this food with impunity; at other times, they have suffered greatly for having made use of it: which corresponds perfectly with the effects produced sometimes by other kinds of food. *M. Edwards* has known persons who were so fond of muscles, that they would not give them up although they had been frequently incommoded by them: it is only passing an unpleasant quarter of an hour, say they. There was one amongst them, who was generally considered to have had three or four diseases of this kind, and who did not expose himself any the less to it, reckoning always on the time when he might eat them without inconvenience.

5th. A lady was scarcely able to eat a single Muscle, without exhibiting the symptoms which have been qualified with the name of poisoning. Another one has an habitual disposition of the stomach, to reject absolutely sorrel and radishes, a disposition which her daughter partakes of; and Muscles do not disagree with them. Another lady is not able to eat strawberries, without experiencing a violent indigestion. The same thing happens to one of her sisters whenever she eats herrings. Lastly, another sister is not able to eat Muscles, without experiencing the symptoms of swelling, and cutaneous eruptions which frequently result from them.

“ If to this day,” says *M. Edwards*, “ it has been impos-

sible to prove that Muscles contain a poison hurtful to all persons in general, and that, on the other hand, this kind of food produces only effects common to several kinds of fruit and fish, it is more rational to make them depend on a peculiar disposition of the stomach, a disposition which may take place all at once, continue, or cease after a certain time.

OF POISONOUS ANIMALS WHOSE FLUIDS HAVE BEEN DEPRAVED BY ANTECEDENT DISEASES.

1010. It has been long known, that horses, oxen, sheep, and even the human species, under certain circumstances contract diseases, in which the saliva, the blood, and other humours are altered, and are capable of producing, by their contact with living animals, fatal affections, followed sometimes by death: of this number are pustules, malignant ulcers, gangrene, *rabies*, &c.

MALIGNANT PUSTULE (*ANTHRAX*).

1011. *M. M. Enaux*, and *Chaussier* have collected a very great number of facts, which prove that this disease has for its cause a septic *virus* engendered in diseased animals, and transmitted to man. They have given them in a very excellent work printed at Dijon in 1785, and which has for its title: *Methode de traiter les Morsures des Animaux enragés*.

1st. A shepherd bled one of his sheep, which had just died suddenly; he carried it home on his shoulders; but the blood penetrated his shirt, and was rubbed upon his loins. Two days after, a *Malignant Pustule* appeared upon this spot.

2nd. A person was seized with a *Malignant Pustule* on the finger, in consequence of having prepared a hare. Others have been affected by them, sometimes from introducing the hand into the rectum of a cow, which had been attacked with the *heat*

(feu), or from flaying dead wolves; lastly, from having introduced medicines into the throat of a sick ox. *Enaux and Chaussier.*

3rd. A woman applied her finger to her own cheek, after having touched the acrid serosity, which oozed from a Pustule with which her husband was affected. At the end of two hours, she had a tumor on the cheek which made a rapid progress. (*Thomassin.*)

4th. Every species of insect, in sucking the blood of an animal, which has died in a state of *anthrax*, may also transmit the virus to man.*

5th. *M. M. Enaux and Chaussier* make mention of a man who received a drop of pus on the lower lip, in opening an abscess in one of his oxen, and who contented himself with slightly wiping the part. The same evening, there came on a swelling, pain, and hardness; at length, a malignant *ulcer* made its appearance, with callous edges, turned back, and which was only cured by an operation.

6th. A boy employed in skinning an ox which had been killed at an inn at *Gatinais*, because it had been sick, put the knife into his mouth. Shortly after, the tongue swelled up; he experienced a tightness of the chest; the whole body was covered with pustules, and he died on the fourth day, of a general gangrene. The inn-keeper, who was pricked in the middle of the hand by a bone of the same animal, suffered great pain; gangrene seized the arm, and he expired on the seventh day. The servant girl received on her right cheek a few drops of the blood of the same ox, which produced inflammation followed by gangrene. (*Duhamel.*)

* The Malignant Pustule is not always contagious: *M. Bayle* has seen it reign epidemically in two villages, *Vernet* and *Coulombroux* (department of the Lower Alps), and the persons who were affected did not communicate it to those with whom they slept: there had not been an epidemic amongst the cattle; no animal had died of carbuncle, nor had any suspected food been made use of. (*Dissertation inaugurale soutenue à Paris, en 1800.*)

7th. A woman introduced some medicines into the throat of an ox, and applied immediately her hand, wet with the slaver, upon the bosom of a young girl, who complained at the end of a few hours, of a burning itching of the bosom. A cold shivering took place, with a general horror, intense fever, and *phlyctænæ*, which led this young person to the grave in a very few days. (*Enaux and Chaussier on the authority of Chaignebrun.*)

8th. A man, who had his face naturally covered with pimples, opened an ox, which had died of carbuncle (*charbon*), and applied his hands stained with the blood to his face. An erysipelas of the nature of *anthrax* in a short time made its appearance, which was followed by shiverings, nausea, syncope, and death. (*Chabert.*)

9th. The punctures made with the point of a scalpel, in young men who devote their time to dissections, and who are of a weak constitution, produce sometimes grievous symptoms, such as enlargement of the axillary glands, cedematous swelling, putrid fever, and death.

1012. These observations, and a very great number more which we could relate, prove that the persons most likely to contract this disease are butchers, tanners, farmers, veterinarian practitioners, shepherds, and in general all artisans, who handle the fleeces and skins of animals that have died of any suspicious disease.

SYMPTOMS OF THE CONTAGIOUS MALIG- NANT PUSTULE.

Prominent Variety. The following description is given by Enaux and Chaussier.

First period. Itching troublesome, but slight, without redness, or heat, or tension of the skin; a pricking, sharp but transitory; by degrees the cuticle becomes detached, and forms a serous vesicle, which at first does not exceed the bigness of

a millet seed, but which increases by little and little, and becomes brownish; the itching returns from time to time, the patient scratches, and breaks the vesicle, which covers the hot-bed of the evil: a drop or two of a reddish serosity escapes; the itching ceases for a few hours.

Second period. Formation of a small moveable tumor, hard, circumscribed, flattened, having commonly the bulk and form of a small lentil: the colour of the skin is not yet altered; except only in the centre and under the first vesicle, it is generally of a citron colour, livid and grained: the itchings become more sensible and more frequent; there is added to them a sensation of heat, erosion, and burning; then the texture of the skin swells up, its surface appears tense and shining; the *rete mucosum* swells, and forms round the central point a sort of areola or circle, more or less broad and prominent; sometimes pale, sometimes reddish or livid, sometimes orange or clouded with different colours, with small *Phlyctænæ*, at first isolated, but which unite in the end, and are full of a reddish serosity. The central tubercle, which forms the primitive tumor, changes colour; it becomes brownish, very hard and insensible; it is a gangrenous point, which takes all at once a fresh increase.

Third period. The evil does not confine itself to the thickness of the skin, but penetrates a little at a time into the cellular texture: the centre of the tumour becomes harder, deeper, and entirely black; the eschar extends by degrees; the vesicular areola, which always forms its border, announces and precedes the progressive steps of the mortification. This areola advances and increases by degrees; sometimes it elevates itself and forms round the primitive nucleus a kind of cushion, which gives it the appearance of being depressed, and which forms a second tumor, compact, but less hard, and still sensible. There comes on in the mean time a considerable swelling, which frequently extends to a great distance, which is neither inflammatory nor œdematous, but which partakes of

the *meteorismus* and *erysipelas*; it is a kind of swelling that is elastic and resisting, which causes a sense of strangulation and stupor in the part; gangrene at the same time is making a progress in the cellular texture. If the treatment be methodical, and the subject strong and robust, this third period lasts four or five days. At first the evil stops, the swelling loses by degrees that state of tension and emphysema which characterized the erethism and irritation; the vesicular areola puts on a more lively colour; the true inflammatory character is recognized in it; the patient feels a gentle heat in the part, and repeated pulsations; the gangrene confines itself, giving place after the falling off of the eschar, to a profuse suppuration; but in subjects that are weak, or labouring under *cacochymia*, the disease makes a rapid progress, and the infection becomes general.

Fourth period. After having attacked successively the *rete mucosum*, the skin, and the cellular texture, the alteration becomes general, the pulse concentrated, more or less frequent and unequal; the skin is dry, the tongue parched and brownish; the heat appears moderate; nevertheless the patient feels an internal fire which consumes him: he frequently calls for drink, and nothing assuages his thirst; he is always in a state of exhaustion: he complains of prostration, *cardialgia*, continual anxiety; sometimes he feels acute pains, at other times the breathing is short and interrupted; the urine is rare, thick, and lateritious; diarrhœas, colliquative sweats, and hæmorrhages are sometimes, though rarely, seen to come on. If the mischief goes on to its last term, the patient falls into a state of low delirium; all the local symptoms increase in violence; the swelling becomes enormous, and the patient dies in a state of gangrene, diffusing the most fetid smell. (Op. citat. p. 184—192.)

Depressed variety, described by *M. Davy la Chevrerie*. It begins by a very violent itching, which lasts several days. On the second day, there is formed a black point, similar to the

bite of a flea. The next day *phlyctænæ* circumscribed and regular, pain, heat, and sense of numbness in the part of the limb situate below the eruption; weakness, nausea, concentrated pulse. The *phlyctænæ* break, and a reddish serosity oozes out. A portion of skin is perceived below, which is black as charcoal, and which adheres little to the subjacent parts: there is very little swelling; nevertheless it sometimes exists. On the fifth day, agony, and frequently repeated lipothymia. On the sixth, silent delirium, local tumefaction, gangrenous state very decided; at last death takes place. This variety is more dangerous than the *prominent*.*

OF THE *RABIES* (HYDROPHOBIA).

1013. The opinion most generally admitted at the present day, is, that the *Rabies* is a most terrible nervous disease, which is capable of being produced spontaneously both in men and animals; but *which can also be communicated by the bite of a rabid animal, whose saliva is very much depraved*. It is principally on this last account, that it deserves a place in this work. Of late, *M. Girard* (of Lyons) has endeavoured to prove, that the *Rabies* was never communicated, that the saliva was not the cause of the phenomena which characterize it, but that it depended on a local irritation. We do not conceive that this hypothesis ought to be admitted, because it is not supported by any decisive fact, consequently we shall continue to look upon this disease, as capable of being communicated by inoculation.

Spontaneous Rabies. Horses, mules, asses, oxen, hogs, and, still more frequently, foxes, wolves, cats, and dogs, become rabid without having been bitten; man is likewise in the same predicament, although rarely: lastly, it has been asserted, that cocks and ducks have been seen spontaneously af-

* *Dissertation Inaugurale de M. Davy la Chevrerie, soutenue à Paris, le 7 Janvier, 1807, p. 12.*

fectured with this cruel disease, which they have communicated to other animals. Ruminating animals do not appear to be capable of contracting the Rabies, otherwise, than by inoculation. *Sauvages* speaks, in his *Nosology*, of a young girl who became rabid, and died at the end of three days, in consequence of being very strongly solicited by a young man at the time she had her menses. We read in *Felix Plater*, the history of a young woman who died rabid immediately after a great fright which she experienced from seeing herself left in the night by her companions, while she was occupied in washing linen under a bridge. *Doppert* relates, in the *Annales de Breslaw*, that several children had been attacked with Rabies without having been bitten by any rabid animal. Mention is made in the *Philosophical Transactions of London*, of a man who, going out from the gaming table in despair at having lost his all, bit himself in the wrist, and died rabid. How many more observations of this kind could we not produce, by consulting the *Memoirs of Trecourt*, *Salus Diversus*, *Lecat*, *Kæhler*, *Lavirotte*, *Laurent*, &c. given in different periodical collections?

Causes of Spontaneous Rabies. In general this disease is most frequent in sultry hot summers, and in severe winters, when the animals can no longer find any fluids to quench their thirst.* Unwholesome food, hunger, extreme fatigues in the heat of the sun, the presence of worms in the stomach, strong passions, fright, sorrow, rage, despair, and a number of antecedent diseases are regarded as exciting causes. We are far from thinking that all animals subjected to these causes become rabid; experience formally contradicts this assertion. Three dogs were shut up in one of the Wards of the Veterinary School of Alfort. One of them was fed with salted meats;

* It appears however to be more common in cold, than in hot countries. *Volney* asserts, in his travels, that it is unknown in Egypt and Syria; the same thing may be said for the Cape of Good Hope, according to *Barrow*.—*(Vide his Travels in the interior of Africa.)*

no drink was given him, and he lived forty-one days; another took nothing but water, and he died thirty-three days after; lastly, the third remained twenty-five days without eating or drinking, and he expired. None of these animals experienced any symptom of *Rabies*.*

The symptoms of spontaneous *Rabies* do not differ essentially from those of which we shall have occasion to speak shortly, in giving the history of communicated *Rabies*. They make their appearance, however, as soon as the cause which produces them exists, whereas, in the other variety, they delay their appearance one or two months, and even more.

Communicated Rabies. The *Rabies* is most commonly communicated by the bite of an animal affected with it. It may nevertheless take place by the simple action of licking, or by the application of the saliva to the lips, to wounds, ulcers, or parts covered with mucous membranes. We could bring forward a very great number of observations in support of this proposition: we shall however confine ourselves to the following.

OBSERVATIONS.

1st. *Surlu*, aged twenty-four years, was bit on the 10th of May, 1813, on the *Boulevard de la Salpêtrière*, by a rabid dog, which, during two days, made such great ravages in Paris, that more than sixty persons were bit by him: fifteen of them at least were cauterized at the *Hotel-Dieu* with the iron heated to whiteness. Three of them were still there, waiting for the cicatrization of their wounds, at the moment *Surlu* was brought in. The unfortunate man in question had received three small wounds on the right heel, which *M. Murat*, who is the assistant surgeon of the *Salpêtrière*, cauterized with butter of antimony an hour after the accident. *Surlu*, feeling secure by this operation from the dangers which he would

* *Dissertation sur la Rage*, par M. Bleyrier, soutenue à Paris, le 28 Mars, 1815.

have incurred without it, gave himself up without any uneasiness to his ordinary occupations, and even to all the excesses of debauch during a month, the time in which the cicatrization of his wounds became completed. All at once this young man lost his natural gaiety; all his motions became sudden, rapid; he sat down, rose again precipitately, and without any motive; he wept sometimes, and testified to his parents the fear he had of becoming mad. The next day, he felt a repugnance to drinks, and if any were raised to his mouth, they were suddenly rejected. On the third day from the attack, all the symptoms of the hydrophobia declared themselves; it was now not without trembling that his parents sought to tranquillize him; they took advantage of a moment of tranquillity to put him into a coach, and bring him to an hospital. This patient, on leaving his father's house, had the misfortune to hear it declared, that his death was inevitable: this idea struck him with horror, and he gave himself up a prey to all the fury of the disease. He arrived at the Hotel-Dieu, the 8th of June, 1813, at the end of the third day from the attack. The agitation of this unfortunate man, which was however quieted by some questions calculated to interest him, the vivacity of his looks, united to the disquietude which reigned throughout his whole frame, the foam which issued from his mouth, and which he was spitting incessantly, the sensation of constriction, the pain of the fauces, and the horror which he felt towards all fluids, were the symptoms by which the *Rabies* was recognised.

M. Professor Dupuytren, being convinced of the impossibility of arresting the progress of this disease by the bite of the viper, by the preparations of metallic oxyde, by bleeding, baths, &c. convinced equally of the inefficacy of opium in glysters, even were it given in a frightful dose, not being able to administer it by the mouth, on account of the horror of fluids, resolved to introduce it immediately into the venous system. Consequently, he made a solution of the gummy

extract of opium in distilled water, charged the syringe of *Anel* with it, and after the usual precautions, injected into the saphæna vein about two grains of the mucous extract of opium. The patient, a moment after, appeared more quiet; which suggested to *M. Dupuytren* the idea of doubling the dose of the injection about eight in the evening; he then made choice of the cephalic vein, and introduced into the circulation four grains of opium. The patient remained for three hours in the most perfect tranquillity; but at that period he agitated himself, and frequently changed his position; he rose up, kneeled down on his bed, explored the surrounding space with astonishing rapidity; at one time, he uttered horrible cries; at another, he groaned about the cruel malady to which he was the victim: he incessantly regretted not being able to bid his last farewell to his family, especially to his father. It was then no longer possible to occupy his imagination; he passed the rest of the night in a state of extreme agitation. The next day, (the fourth from the invasion of the symptoms,) *M. Dupuytren* went to visit him at five in the morning, and found him in such a state of dejection, that he thought he would not exist two hours longer. The sister herself, believing him to be dead, had covered him with his sheet. Nevertheless, towards eight o'clock, the patient came to himself, and talked of nothing but his father. In a short time, he agitated himself, was continually spitting, recommended the windows to be shut, and that they should not direct the current of air upon him, nor shake his bed-curtains. His imagination was managed dexterously, by proposing questions which interested him; he answered extremely well to them, and sometimes even with cheerfulness. He permitted the injections to be renewed, under condition that they would send for his father. They promised to do whatever he desired, and an ounce of distilled water, holding in solution from six to eight grains of opium, were introduced into the circulation. The patient was left to himself. Half an hour after, *M. Dupuytren* returned to see

him, and found him in the same situation in which he had left him the evening before, and during the same day ; the mouth half open, and filled with a frothy saliva ; the eyes fixed ; the head slightly bent backwards, without any tetanic movement ; the breathing short, the pulse scarcely perceptible ; in fine, he expired a few moments after.

On the 19th of June, during the time which elapsed between the last injection, and the death of this patient, *M. M. Magendie* and *Breschet* took some of the saliva, transported it twenty paces from the bed of the patient, by means of a piece of linen, and inoculated with it two dogs in good health. One of them became rabid the 27th of July, and bit two others, one of which was at the height of the disease on the 26th of August.*

2nd. *Cælius Aurelianus* asserts, that a sempstress became mad in consequence of having mended a garment that had been torn by a rabid animal. She had passed the thread into her mouth, and pressed the seams with her teeth.

3rd. *Palmarius* relates, that a peasant in a state of *Rabies*

* *Dissertation sur la Rage, par M. Charles Busnot, soutenue à la Faculté de Médecine de Paris, le 12th Fevrier, 1814.*

M. Girard, who does not admit the existence of communicated *Rabies*, has made the following objections: 1st. Supposing, that the dog that bit *Surlu* was mad, the venom ought to have been destroyed by the canterization of the three small wounds made in the heel. 2nd. The symptoms developed by the rabious venom are first felt in the part bitten ; now, *Surlu* did not appear to have experienced any remarkable symptom in that part, since no mention is made of it in the observation. 3rd. The symptoms to which this person was a victim, cannot be of any use to prove that he was rabid, for they are common to many nervous affections, both internal and external. 4th. How can it be proved, that the dogs which *M. M. Magendie* and *Breschet* inoculated with the saliva of *Surlu* were rabid, since every thing relating to these dogs is not made known from the moment of their biting to the end of these experiments, and no information is given relative to the appearances on dissection ?

It is easy to perceive how far these objections are from proving that the *Rabies* had not been communicated to the person who forms the subject of this observation, and to the animals inoculated by his saliva.

called together his children, kissed them, and communicated to them the *Rabies*, of which they died on the seventh day. The same author assures us, that he has seen oxen, horses, and sheep, contract the *Rabies*, in consequence of having eaten some of the litter on which rabid pigs had died.

4th. *M. M. Enaux* and *Chaussier* have seen a man attacked with this disease from having received the saliva of a mad dog on the lip.

Symptoms of Communicated Rabies. *M. M. Enaux* and *Chaussier* have described with the greatest care the symptoms of this horrible disease, which several other authors have since copied without pointing out the source: "As the wound is the hot-bed of the poison, so it is always by it that the symptoms begin. If it be closed, the cicatrix becomes red, bluish; it extends, sometimes opens afresh, and a reddish serosity oozes out; the sleep is disturbed, agitated, troubled by starts and frightful dreams: the patient is overwhelmed with solicitude, heavy, plunged into a profound melancholy, without knowing the cause of it, from which nothing can distract him; from time to time, he experiences a heat, a horror which extends from the wound, mounts upwards, gains possession of the whole body, and seems to terminate in the breast and throat; frequently the pulse is small, hard, and tight. This state is the first degree of the disease, and lasts four or five days. In the second, all the symptoms increase, the pulse becomes frequent, and indicates an irregular and nervous fever, which destroys the principle of life; the patient experiences a painful tightness of the chest and throat; the breathing becomes difficult, interrupted by involuntary sobs, and deep sighs; from time to time convulsions are perceived, which are kept up, or renewed by the slightest cause; in a short time, reason wanders, the patient becomes furious, does not know those about him, and endeavours to bite them;* every thing teases

* This sign is far from being universally present in Rabid men; we have

and irritates him. Bright colours, a strong light, acute sounds, sometimes even the simple agitation of the air renews his paroxysms of madness ; consumed by an internal heat, tormented by a considerable thirst, he still dares not drink ; the sight of water, the idea of it even, makes him shudder ; the eye is haggard, fixed, sparkling, and appears inflamed ; the voice is hoarse, the mouth filled with a frothy and glutinous saliva ; every thing announces madness, and characterizes the hydrophobia. At one time, preserving his judgment, mild, and peaceable, plunged into a profound melancholy, he is conscious of his misfortune, foresees attacks, and gives notice of them to his friends ; but almost always the sight of water causes him a secret horror, which reason is not able to overcome. (A circumstance which has caused the name of *hydrophobia*, that is to say, *horror of water*, to be given to this disease.) Agonies and vomitings aggravate these evils ; the pulse becomes unequal, intermitting ; a cold sweat covers the whole body, and death puts an end to this scene of horror. This state lasts at most three or four days." (*Methode de traiter les Morsures des Animaux Venemeux*, p. 28.)

This disease generally takes place before the ninth day in oxen and dogs, sometimes later : in the human subject, the invasion does not take place till after thirty or forty days, although there are instances of a more speedy attack ; and others in which the symptoms have not appeared till after several months.

LESIONS OF TEXTURE OBSERVED AFTER THE DEATH OF RABID ANIMALS.

1014. We are astonished on reading the authors who have written on this disease, at the varieties which the bodies of

witnessed eight cases, in which it did not appear. *M. Dupuytren* is of opinion, that it is in the nature and essence of the dog, and not that of a man, to bite.

animals that have died of it, have exhibited: Sometimes they have not discovered any sensible lesion; we have seen four instances of this kind; and *Professor Dupuytren* gives an account in his lectures, of ten dissections, the results of which were similar. Sometimes the mucous membrane of one or more parts of the digestive canal is found in a state of inflammation, and even gangrene.

M. M. Dupuytren, Magendie, and Breschet, who have made experiments on mad dogs, have often observed after their death, an inflammation of the internal coat of the stomach. Sometimes a sufficiently great quantity of worms have been met with, to induce some authors to suppose that they were the cause of the *Rabies*, and consequently that this was not a disease *sui generis*. In other instances, the membranes of the brain and of the spinal marrow have been found inflamed, the brain dried up, with or without effusion. The lungs have also been found adhering to their membranes, distended with black thick blood, or parched and dried up; the heart pale, and emptied of blood.

This short exposition is sufficient to shew how much uncertainty this part of the science presents.

TREATMENT OF POISONING BY VENOMOUS ANIMALS.

Serpents. The number of medicines which have been believed to be entitled to the name of specifics against the bite of venomous Serpents, has been greatly exaggerated. Amongst those which have been proposed as such, there are some that deserve our attention, whether on account of their appearing to act an important part in the treatment in question, or of their having been extolled by men of distinguished merit. What more wonderful, for instance, than the success which the negroes have for a long time obtained from the *Guaco*, a plant which grows in several parts of America, and which the

Indians make use of to defend themselves against the bite of the numerous venomous Serpents which infest their country, to such a degree as to render it uninhabitable. The following are a few peculiarities on this subject, which will not be read without interest.

1st. *Of the Guaco.* M. M. de Humboldt and Bonpland have been the first to give a good description of this plant, (*Plantes équinoxiales*, tom. ii. p. 84, tab. 105.) under the name of *Mikiana Guaco*.

The *Guaco* grows naturally in the remarkably round plains of the valley of the *Rio de la Magdalena*, of the *Rio Cauca*, of the *Choco*, of *Barbacoas* (kingdom of New Grenada). These travellers, however, have seen it also in the temperate region of *Tuffagafuga*, at 940 toises of elevation, where the centigrade thermometer ranges from 17 to 22°. Between the tropics, the *Guaco* may be cultivated on heights of 1400 toises, where the temperature in the night sinks to five centigrade degrees. The *Mikania Guaco* has been frequently confounded, in late publications, with the *Ayapana* of Brazil. (*Eupatorium Ayapana* of Ventenat, *Jardin de la Malmaison*, p. 3.)

Don Pedro Fermin de Vargas, magistrate of the village of *Zipaquira*, undertook a journey to *Mariquita*, in the year 1788, in order to assure himself of the surprising effects of the *Guaco* against the bite of the Serpents of America. The report which he made on this subject was printed in one of our journals, the principal results of which we shall extract.*

The 29th of May in the evening, a negro was directed to procure a venomous Serpent, called in the country *Taya-equiz*. The next day, Vargas, being persuaded by the assurance with which the negro recounted the effects of the *Guaco* for hindering venomous Serpents from biting, desired to submit himself to the experiment. He took one or two spoonfuls of the juice of this plant: six incisions were made upon him; one on

* *Semanario de Agricultura y Artes dirigido a los parrocos*, tom. iv. p. 397. Madrid, 1798.

each foot between the toes, another between the fore-finger and thumb of each hand; lastly, two on the lateral parts of the breast. He caused a little of this juice to be inoculated into the wounds, as is done with the vaccine virus: as the blood flowed from these incisions, they let fall a few drops of the same juice upon them, and rubbed the wounds with the leaf of the *Guaco*. He then took into his hands, and at three different times, the venomous serpent, which seemed a little uneasy, but did not shew the least appearance of having any inclination to bite. Several persons who had been witnesses of this fact, wished also to submit themselves to the experiment; and the results were the same, except in the case of *Don Francisco Matiz*, who was bitten on the right hand, because the reptile was much irritated in consequence of some forced movements which he was obliged to perform. The spectators were all in great consternation, when the negro wiped away the blood which flowed from the wound, and rubbed the bitten part with the leaves of the *Guaco*, and affirmed that no harm would result from it. In fact, *Matiz* breakfasted as well as usual, and was able to attend to his business.

The negroes are in the habit, after the inoculation we have described, to continue the use of this plant every month during three or four days, in order to run no risk in taking the venomous reptiles. *Vargas* is of opinion that this practice is needless, and that it is sufficient to rub the hands with the leaves of this plant a little before laying hold of the animals; for he is of opinion, that the disagreeable smell which it exhales, is sufficient to torment these reptiles, and put them to sleep. We owe to the friendship with which *M. Humboldt* has honoured us, several particulars on this subject. "I have observed," says this celebrated naturalist, "that on tying a very venomous serpent (*Coluber Corallinus* of Lin.) upon a table, and bringing a pole near him, he does not turn away his head until the extremity of the pole has been dipped in the

juice of the *Guaco*. This experiment induced me to believe that the inoculation of the *Guaco* imparts an odour to the skin; and that the serpent is afraid to bite, on account of this peculiar modification of the cutaneous perspiration. I doubt whether it is sufficient, to prevent being bitten, to carry about with one the leaves of the *Guaco*. The natives assured us, that it was necessary to be inoculated. When the bite has taken place, they place the leaves of the *Guaco* chewed and mixed with the saliva upon the wound, and at the same time take the juice of the plant internally. At *Tuffagafuga*, a horse that had the whole foot swelled up from the bite of a serpent, refused at first to eat the *Guaco*, which has a bitter taste and a disagreeable smell; in a short time, however, as if the animal had the knowledge that it would cure him, he fed on it with an appetite. The swelling of the leg very soon subsided."

It would be a desirable thing, that the Spanish Government should appoint a committee, composed of some enlightened members, who might employ themselves in multiplying and varying the experiments proper for fixing our ideas on one of the most extraordinary results that have ever been obtained.

2nd. The *Arsenite of Potash*, and the *Arsenious Acid*, have also been employed with the greatest success against the bite of venomous serpents. We read in the second volume of the *Medico-Chirurgical Transactions of London*, several observations in support of this fact.

A. *Jacob Course*, a private in the York regiment, was bit on the left hand by a serpent which was supposed to be the *Coluber Carinatus* of Lin. The middle finger was so lacerated, that it appeared necessary to amputate it immediately at its articulation with the metacarpal bone. Ten minutes after the wound, this man was in a state of stupor and insensibility. His hand, arm, and breast of the wounded side were very much swelled, of a black purple colour, and livid; he vomited, and appeared to have taken a strong dose of poison; the pulse was lively and hard: he scarcely perceived the

operation. The wound having been dressed, and the patient put to bed, a purgative glyster was ordered him, and the following draught :

R_x. Liquor Arsenical. 3 ii. *
Tinct. Opii gtt. x.
Aquæ. Menth. Pip. ʒ iss M.

To this draught was added half an ounce of lemon juice, and he was made to swallow it during the slight effervescence which this mixture produced. The stomach did not reject it; and it was repeated every half-hour for four successive hours. The suffering parts, however, were fomented and rubbed with the following liniment :

R_x. Ol. Terebinth.
Aquæ. Ammon. pur. āā ʒ ss.
Ol. Olivar. ʒ iss. M.

The purging glyster was twice repeated before the patient experienced its effects. The arsenical draught was then discontinued. He had already recovered his feeling, and by little at a time resumed all his faculties. He then took some food, and slept for several hours. The next day he was extremely weak, and very much fatigued. The fomentations and liniment were continued, the swelling disappeared by degrees, and the skin recovered its natural colour. It was only necessary, in order for his perfect restoration, to keep the bowels open for a few days, and to apply suitable dressings to the wound.

B. *Dover*, a negro soldier of the 3rd West India regiment, was bit on the left hand by the same serpent. A few minutes after, vomitings, torpor, and insensibility took place; but there was less swelling and alteration of the colour than in the preceding case; neither was the wound so extensive. The edges, which were lacerated, were removed; the wound was dressed,

* This liquor is Arsenite of Potash: two drachms contain one grain of Arsenic, and as much Potash; the rest is water.

and the arsenical draught given him. The fomentations and liniment were likewise employed: a purgative glyster was administered every hour; the patient took the draught every half hour for four hours, and its use was suspended as soon as he began to be purged. He had then four hours sleep. The next day he appeared less weak, and found himself shortly after in a state to return to duty.

C. *Thomas Rally*, private of the 68th regiment, was bit on the lower part of the left leg, and brought to the hospital in the same state as *Jacob Course*. The lacerated edges of the wound were cut off, dressings applied, and the arsenical draught administered, cathartic glysters were likewise employed, with fomentations and the liniment. When he had taken the draught every half hour for three hours, there came on a violent vomiting, to that degree that the stomach was able to retain nothing; however at the end of four hours, by the use of glysters, he began to be purged; and after two hours more, the vomiting ceased; he took then the following draught:

R̄. Tinct. Opii. gtt. xx.

Æther. Sulphur. gtt. xv.

Aquæ. Menth. Pip. ʒ iss. M.

He was quiet for several hours. The next day, he was extremely weak, and experienced great difficulty in making water. It was consequently necessary to resort to the catheter several times during the two first days. Emollient fomentations were applied to the region of the bladder. On the third day, all the alarming symptoms began to diminish, and from that time he quickly recovered.

D. *Patrick Murphy*, private of the 68th regiment, was bit on the wrist by the same serpent. A few minutes after, the hand and arm of that side began to swell, and were already discoloured. He did not yet vomit. The wound was dressed, after having cut off the lacerated edges, and he was made to take the arsenical draught. Cathartic glysters were

also prescribed, with fomentations and the liniment. He took the draught every half hour, for three hours; and then, finding himself very well, he ceased to take it. The symptoms were not so severe in this, as in the preceding cases. The fomentations and liniment only were continued, and in two days he returned to duty.

E. An officer and several men of one regiment, died in consequence of having been bitten by the same animal. None of them had taken the arsenical draught.

These observations were collected at Saint Lucia, by M. J. P. Ireland, Surgeon to the 4th Batt. of the 60th regiment of foot.

F. A soldier of the 63rd regiment was bit by a small serpent of Martinique. The treatment we have described was employed, and the patient was quite well a few days after.

Russel, in his work on the snakes of India, relates experiments which were made with the arsenious acid, with the design of combating the symptoms produced by the bite of venomous serpents. We think it a duty to describe the principal results of that undertaking, although they are not sufficient to fix our ideas on that head.

Experiment 1st. A small dog was made to swallow one pill of *Tanjore*;* immediately after, he was made to be bit in the thigh by a *Cobra de Capello*, and the half of another pill dissolved was applied to the wound. The animal slavered greatly during the following ten minutes. At the end of an hour, he began to complain, laid down, and had slight convulsions. A second pill was administered to him, which also increased the flow of saliva. Four hours after, he was perfectly recovered.

Experiment 2nd. A young dog was caused to be bit by a

* An Indian preparation, very much in vogue for the cure of the bite of venomous animals. *Russel* does not give its composition; but he says, that the *white oxyde of arsenic* (arsenious acid) forms the base of it, and that a pill of six grains contains something less than three quarters of a grain of it.

Katuka Rekula Poda, which had already bitten and killed a rabbit. A few moments after, half a pill of *Tanjore* was given him, and the dog soon recovered.

Experiment 3rd. Another dog was bit on both thighs by a *Cobra de Capello*. Two minutes after, he was made to swallow a pill and half of *Tanjore*, which produced good effects: the animal recovered.

Experiment 4th. Half of one of these pills was given to a fowl; ten minutes after, the same *Cobra de Capello* was made to bite it, as had served for the preceding experiment; the animal soon died. Another fowl experienced the same fate; nevertheless the ingestion of the pill appeared to retard the moment of death.

Experiment 5th. A rabbit was bit by a *Katuka Rekula Poda*; a pill of *Tanjore* was administered to him in twice, which did not prevent the symptoms from taking place, and terminating in death.

Experiment 6th. A bitch was bit in both thighs by another individual of the same species: she was made to swallow a pill, but died as if she had taken nothing.

Experiment 7th. Two other dogs were bit in the thigh by a *Katuka Rekula Poda*. One of them took a pill five minutes after; the other swallowed one at the end of six: the symptoms took place, and the animals died.

3rd. *Ammonia* and *Eau de luce*. These fluids have for a long time been regarded as specifics against the bite of venomous serpents. *Bernard de Jussieu*, in 1747, cured by this means, a young man, who had been bitten by a viper in three places, viz. in the thumb and fore-finger of the right hand, and the thumb of the left. A number of authors have reported similar facts. *Sonnini* says,

“ A young Indian had been bitten for several hours on the great toe by a serpent (*Serpens Echinatus*); his foot, leg, and thigh were prodigiously swelled and hard; he had a most violent burning fever, with delirium. The Indians had em-

ployed all the remedies they were acquainted with : they had crushed the head of the serpent, and applied it to the wound previously scarified ; the patient had swallowed its liver, which passes amongst them for an excellent specific against the poison of all venomous animals ; they had employed in vain several other remedies, and the patient was expiring. *Sonnini* made him swallow a tea-spoonful of *eau de luce* in a little wine ; he scarified again the wound, in order to make it bleed, and applied to it a compress wetted with the same fluid. Two hours afterwards, the swelling and tension had sensibly diminished, as well as the fever. He was made to take a second dose, and the compress was renewed ; it was now nine in the evening. He was left quiet during the night, and the next morning he was found walking about in the room, with the assistance of a stick ; he had slept, and the fever had quitted him ; there remained only a little swelling of the leg, which insensibly disappeared, and on the third day he went to his occupation of fishing.*

Nevertheless *Fontana* pretends, on the authority of a very great number of experiments, that these preparations, whether employed internally or externally, are rather injurious than useful. *M. Everard Home* also combats the opinion of those who maintain, that ammonia and *eau de luce* are specifics against the bite of serpents (*Vide* page 410). We are of the same opinion as this celebrated surgeon ; but we still think that the prudent administration of the volatile alkali cannot be injurious, and even that it may become extremely useful by promoting perspiration.

Caustics. No one is ignorant of the advantages of the speedy application of caustic to the part bitten by a venomous serpent. *Fontana* has concluded from his experiments, that the *caustic potash* was the specific against the bite of the viper ; an assertion which cannot maintain its ground, if we reflect on

* *Journal de Physique*, ann. 1776. tom. viii. p. 474 ; Observations by *Sonnini* on the serpents of Guyana.

the manner in which this alkali acts. In fact, its action is similar to that of all the other caustics. *Russel* has made several experiments on their use against the bite of the serpents of India, which tend to induce a belief that this method is not constantly followed by success, especially when it is employed fifteen or twenty minutes after the bite.

Experiment 1st. A dog was bit by a *Katuka Rekula Poda*; a few moments after, the symptoms made their appearance. He was cauterized at the end of a quarter of an hour with a hot iron, which did not retard the moment of death. Another dog, bitten by a serpent of the same species, was two minutes after under the influence of the poison. He was cauterized at the end of fifteen minutes, with sulphuric acid, and he died. The experiment repeated on another dog, who was not cauterized till eighteen minutes after the bite, presented the same results. Lastly, two others of these animals experienced the same fate.

Experiment 2nd. A bitch was bit by a *Cobra de Capello*, which had just killed a dog that he had bitten. The bitch was paralyzed instantly. The wound was cauterized with a hot iron three minutes after the bite, and she recovered. A dog was cauterized with sulphuric acid fifteen minutes after having been bitten by a *Katuka Rekula Poda*: he recovered his health. The same thing happened to another; but the serpent that bit him, had killed an animal a few moments before. Lastly, two dogs, bit by a *Katuka Rekula Poda*, were cauterized with the sulphuric acid fourteen minutes after, and recovered completely.

Russel says, in recapitulating his experiments: "the caustics have often proved ineffectual, although employed four, eight, twelve, or fifteen minutes after the bite. They have been constantly useless when applied later. As for the animals that have been saved, further experiments must be made before any thing positive can be established respecting them."

4th. *Hunault* and *Geoffroi* have demonstrated, that the oil

of olives is not a specific against the bite of the viper, as it had been asserted in the *Philosophical Transactions of London* (No. 443). They however acknowledge the utility of fomentations with this greasy substance.

5th. According to *Fontana's* report, acids, cantharides, theriaca, the viper's fat, leeches, suction, so much employed by the *Psylles* and the *Marses*, do not in any manner hinder the dangerous effects of the viper. Scarifications, according to the same author, are rather hurtful than useful. Baths with warm water diminish the dangers, which cease altogether after a speedy amputation of the part bitten.* Lastly, ligatures sometimes prove a security from accidents.

1015. After having examined succinctly each of the means proposed up to the present day, as specifics against the bites of venomous reptiles, we shall proceed to lay down the steps which the practitioner ought to take in cases of this description. These steps without doubt will be modified, when the effects of the *Guaco* and arsenious acid shall have been appreciated at their just value.

A ligature should be instantly applied above the part bitten; this ligature should neither be too tight, nor applied for too long a time, for it would increase the lividity of the part, and expose it to gangrene. If it can be done, the bitten part should be soaked in warm water for some time. The wound should be cauterized with a red hot iron, lunar caustic, or a small piece of thin wood, the extremity of which has been soaked in butter of antimony, and multiplied scarifications should be avoided, as they frequently aggravate the symptoms. Compresses moistened with a mixture of one part of ammonia, and two of oil, should be applied to the swelled parts. When the swelling shall have become too considerable, and the ligature prove painful to the patient, it must be removed, for

* The experiments made by *Russel* with the serpents of India, are far from confirming that assertion of *Fontana*, viz. that the symptoms cease by the amputation of the part bitten.

the only intention of its application was to retard the circulation of the blood by impeding it in that part, and that end has been obtained. The internal treatment must next be attended to, which consists in general in favouring perspiration and sleep. To this end, the patient should be made to take, every two hours, a glass of the infusion of orange or elder flowers, containing two, six, eight, ten, or twelve drops of fluid ammonia, and even more, if the patient be robust. Exciting and antispasmodic drinks, such as Madeira, old wines, and ether draughts, have frequently been useful. Care should be taken to keep the patient well covered in bed; and, while he is sweating, care must be taken to avoid cooling him, on applying the dressings, or in giving him drink.

Should spasms, jaundice, or bilious vomitings come on, it will be necessary to administer ipecacuanha, or the antimoniate tartrate of potash. In fine, in those cases where the gangrene advances with rapidity, it will be necessary to have recourse to powerful antiseptics. It is needless to observe that the use of solid food should not be permitted during the early stages of the disease. When the patient begins to be tormented by hunger, weak soups should be allowed him, in small quantity, and but seldom at first; but when he begins to recover his strength, more frequently.

Scorpion. The remedies to be employed against the sting of the scorpion, are volatile alkali internally and externally, and the plants of the family of the *cruciferae*, softening, emollient, and oily topical applications, which diminish the inflammation.

Spiders. In these cases, the wounded part should be washed with brine; theriaca should also be applied to it, and one or two doses should be prescribed internally.

Tarantula. To combat the effects of the Tarantula, such local means should be employed as serve to allay inflammation and tumefaction. It is well known how much the soft accents of music, and the measured movements of the dance, have

been extolled for the cure of *Tarentism*. Have not even airs been composed, to which the name of *Tarentolati* has been given, and sung to persons stung by this insect? We are far from refusing to music a great influence on the vital functions, and on the restoration to health of a certain number of persons who may be sick; but we are of opinion, that, in the case before us, it cannot be of any real utility except to those who may be fallen into a profound melancholy. We are far however, from blaming the use of this remedy, as no serious injury can result from it. *Amoureux* says, "music and dancing are very capable of imparting to the patient an emotion and agreeable sensation according to circumstances: he must be made to hear such sounds as sooth, agitate, charm him; and as every thing degenerates into abuse, an agreeable treatment has been converted into an exhibition. Picture to yourself, men and women with their brain affected, who, in concert with mountebanks and musicians paid for the purpose, exhibit a weeping farce, worthy of the spectators and of the performers. Such is the pretended *Tarentism*: it consists of sighs, tears, bursts of laughter, contorsions, gesticulations, which degenerate into ridicule." (*Op. citat.* p. 220.)*

* There are some persons who are so sensible to music, that it is impossible its employment should not be attended with great success in certain nervous diseases with which they are sometimes attacked. A number of authors have treated of the advantages which might be derived to medicine from this source; it has nevertheless, lain nearly in oblivion. We are fully persuaded that it might be rendered extremely efficacious under certain circumstances. Having from four years old felt a passion for this enchanting art, we have always cultivated it at every moment of leisure. Scarcely had we attained fifteen years, when it was impossible for us to hear the *chef-d'œuvres* of *Mozart* and *Cimarosa*, without experiencing great emotion, which was different according to the character of the music we were listening to. The nervous, hardy, and brilliant compositions of *Mozart*, excited in us a remarkable gaiety and courage, which continued during a great part of the night, and was accompanied with a trembling of the lower limbs. The melodious and affecting accents of *Cimarosa* plunged us into a melancholy, and we took a pleasure in shedding tears. When arrived at

Bee and Humble Bee. Should a medical man be called to a case of this kind, he ought to have recourse to the proceeding of *Swammerdam*, which consists in drawing out the sting, which is deeply buried in the flesh, taking care not to press hard on the wound, because the venom of the vesicle would be expressed, and would penetrate further with the sting. It must not be concealed, that this extraction is attended with difficulty, on account of the lateral filaments with which the sting is armed. It will be necessary then to cut off with scissars all that is outside the wound; and afterwards, to extract the sting with a small needle. The part punctured ought then to be washed with cold water, or, what is better still, as it was first discovered by *Dioscorides*, with salt and water, or sea-water. It would likewise be extremely serviceable to apply to the part in pain, some of the milky juice of the white poppy, or any other anodyne. *M. Delaistre* relates, in the *Journal de Médecine*, that he made use of this juice to appease a severe pain occasioned by the sting of a Bee; he was in a short time eased, and no swelling supervened (tom. iv. p. 309). Oily embrocations, Goulard water, and lotions of urine, may also become useful: but very little faith ought to be given to that incoherent assemblage of plants too frequently employed by empirics and country people.

the age of twenty, we were seized with a nervous affection, the evident result of this great degree of susceptibility; continual palpitations so strong, that the contractions of the heart could be felt a little above the navel: the pulse unequal, irregular, intermittent; a considerable difficulty in breathing, flying pains in the lower extremities, especially along the course of the posterior nerves; such were the symptoms to which we were a prey during six months, and which ceased only when we perceived at length the necessity of ceasing to listen to music. At this moment, when seven years have elapsed since the disappearance of these nervous symptoms, we are able to hear and to execute it with impunity; but it still does not fail to produce a remarkable effect upon us; for it quiets in a very short space of time, and, as it were by enchantment, a general cephalalgia, which is tolerably severe, to which we are subject about eight or ten times in the year.

Wasp and Hornet. The treatment to be employed for the sting of these insects, is the same as we have described above.

Poisonous Fish and Muscles. The practitioner called in to a case of this kind should administer an emetic, a purge, or emeto-cathartic, according to the time that has elapsed since the ingestion of the deleterious substance; by this means, he will produce the expulsion of it, without which, the symptoms will become more intense, and may possibly terminate in death. The patient should next be made to take small pieces of sugar containing ten, fifteen, twenty, or five and twenty drops of sulphuric ether, a few spoonfuls of an antispasmodic mixture, and vinegar and water should be given for common drink. In case symptoms of inflammation of the abdomen should make their appearance, it will be necessary to combat them by antiphlogistic means. Such are the precepts arising from the observations hitherto made: it is to be hoped that learned travellers who pass through countries where the occasions of seeing poisonings of this kind are frequent, will endeavour to determine what is the intimate nature of the poison of these animals, and the means capable of destroying or opposing their effects.

Malignant Pustule. We have distinguished, in the description of the Malignant Pustule, four periods, which really exist when the disease is left to itself: but, with the assistance of a methodic treatment, the symptoms may be prevented, or arrested in case they have already displayed themselves. This treatment consists in producing an inflammation of a good character, which keeps the gangrene within bounds, and facilitates the separation of the slough; which end may be obtained by means of incisions and caustics. The incisions, say *M. M. Enaux* and *Chaussier*, open the way to the caustic remedies, and these concentrate within the eschar the septic poison, at the same time that they excite, and produce inflammation and suppuration. Extirpation made in the living parts

is a cruel and dangerous method; the same may be said of deep incisions. Caustics, so efficacious in the first periods, are but little applicable in the latter, when the Malignant Pustule is accompanied with putrefaction: it is necessary then to insist on the use of such topical applications as are capable of restoring animation to the fleshy parts, of remedying the putrid dissolution, and of giving more consistence to the eschar. The bark combined with camphor fulfils these indications. Internal remedies are never indifferent; in the fourth period of the disease they are absolutely necessary; they ought to be chosen from the class of tonics and antiseptics. Relaxing topical means, as well as bleeding, purgative, and all other medicines which tend to weaken the organic action, are always hurtful; they dispose the parts to gangrene, render suppuration more laborious, and the cure more difficult.

Rabid Animals. The first question which presents itself, is to know whether we can cure the animal labouring under the *Rabies* either spontaneous or communicated, when perfectly developed. Several authors answer in the affirmative, and report observations in support of their assertion.

M. Nilloughby speaks of a child that became rabid forty-eight hours after having been bitten by a dog. He was bled, an excessive dose of calomel (*sub-chloruret of mercury*), was given him, and he was cured.*

A young man labouring under a violent inflammation of the stomach, was affected with convulsions and symptoms of hydrophobia: he was cured by copious bleedings.†

M. Schoolbred, surgeon to the Indian Hospital at Calcutta, mentions having cured, by copious bleedings, a servant, twenty-five years of age, who exhibited all the distinguishing characters of hydrophobia, seventeen days after having been bitten by a mad dog. He was led to this practice from having read

* *Journal Général de Médecine*, Janvier, 1810.

† *Collection d'Edimbourg*. Baldenger, tom. 1er, p. 236.

an observation of M. Tymon, in which he speaks of a person in the same situation, who was also cured by bleeding.*

Mead, Boerhaave, Rutherford, and some other practitioners, have likewise thought that bleeding might be extremely useful in this disease.

We read in the *Bibliothèque de Chirurgie du Nord*, that M. Grisly, by bleeding and attenuating medicines had cured a lady, who had been bitten by a mad dog eighteen days before, and who had experienced no paroxysm of hydrophobia until that day.†

The experiments recently made in Paris by M. M. Dupuytren, Magendie, and Breschet, on mad dogs, are far from confirming the results obtained by the authors of the preceding observations; they employed bleeding *ad deliquium*, and obtained no success. Nevertheless, we are of opinion, that it would be imprudent to reject it without having reiterated the experiments, and especially without having made use of it in all the different stages of the disease.

Many observers have extolled opium, administered under various forms, for combating the symptoms of hydrophobia, and they pretend to have employed it with success. We have seen it given here by M. Dupuytren without the least advantage, whether administered in glyster, or injected into the veins. The experiments made on mad dogs by the authors already quoted, confirm these results: they were never able to obtain a cure; they have only observed, that animals affected with this disease require, in order to be under the influence of this medicine, a dose much stronger than sound animals.

M. Alibert relates, in his *Elémens de Thérapeutique*, the observation of a person who had been bitten in the middle finger by a dog; he became mad. M. Rossi cured him by

* *Memoire lu à l'Institut de France, le 6 Septembre, 1813, ou Journal de Médecine, par Sedillot, Decembre, 1814.*

† Tome i. p. 44.

means of the electric fluid disengaged from the pile of Volta (Galvanism).

M. Dupuytren has lately made use of the distilled water of the *Prunus Lauro-Cerasus*, which he has injected into the veins. This method has also been employed on mad dogs: it has not in any case been followed by a cure.

1016. These facts permit us to conclude, that, in the present state of science, no medicine is known which will constantly cure the hydrophobia when declared, and that it is, consequently, indispensable to cauterize the bite with a red hot iron, in order to prevent its developement. This cauterization will be followed by effects so much the more successful, as it shall have been employed the shortest time possible after the bite of the animal.

APPENDIX.

CORROSIVE SUBLIMATE (CHLORURET OF MERCURY).

WE have announced, page 60, vol. i. part i., that *Dehorne* had exclaimed with animosity against the absorption of Corrosive Sublimate; he asserted beside, that this substance could not produce death, when applied to wounds or to the cellular texture. Our experiments not agreeing with these results, we affirmed, that death might be the consequence of the imprudent application of this caustic externally. In truth, we thought of being obliged to reject the idea of absorption, in consequence of the experiments and considerations of *M. Brodie* and *Lavort*: at this moment we are perfectly convinced, not only of the danger incurred by the external application of Corrosive Sublimate, but also of its absorption. Our friend and pupil *Dr. Smith*, has put this truth beyond all doubt, by numerous experiments made in our presence, which he has detailed in an excellent inaugural dissertation sustained at Paris, the 15th of May, 1815.*

When from four to eighteen grains of Corrosive Sublimate are applied to the cellular texture of the inside of the thigh of a dog, even when inclosed in a fine linen, sadness, loss of appetite, sometimes vomitings, stools frequently bloody, weakness, general paralysis, are the only symptoms which precede

* *Dissertation sur l'Usage et l'Abus des Caustiques.*

death, which constantly takes place without convulsive symptoms. On opening the body, it is observed that the stomach exhibits at one time an inflammation very evident of the mucous membrane, with a sanguineous exhalation on its interior surface; at other times, black spots; lastly, sometimes ulcerations. The rectum is the seat of two very distinct alterations; at one time it exhibits a remarkable thinness of its coats, which have contracted a livid colour more or less marked, in consequence of the contact of a fluid which is red, blackish, and very fetid, which it usually contains; at other times, and in the greatest number of instances, this intestine is contracted upon itself; and the folds, which the mucous membrane then forms, are red or blackish, either throughout, or only in one point of their extent, and that is most commonly in their superior part. This alteration of the great intestines is met with, both when the poison has been applied to the neck, or injected into the veins. The duodenum has presented sometimes near the pylorus, some spots similar to those which existed in the stomach. The other small intestines have appeared little altered. In one of these experiments, the heart exhibited black spots in its fleshy texture, immediately below the internal membrane of the ventricles. The lungs are frequently the seat of a sensible alteration; sometimes they are distended with a black blood, which does not, however, prevent them from crepitating; more frequently, there are black spots or sanguineous infiltrations existing on the anterior edge of these organs, the centre of which sometimes projects like a tubercle below the pleura.

The same organic lesions have been observed when one or two grains and a half of Corrosive Sublimate have been injected into the jugular vein, dissolved in water.

M. Smith is of opinion, in consequence of these experiments, that the Sublimate injected into the veins, or externally applied, produces death by acting upon the heart, without any primitive lesion of the brain and nervous system; he thinks, on

the contrary, that this lesion does take place when the poison has been introduced into the stomach; at first, in consequence of the nervous phenomena which take place in this case; and afterwards, from the great sensibility with which this viscus is endued.

1017. The following are the experiments which *M. Brodie* has had the goodness to communicate to me, which tend to confirm the action of Sublimate on the heart, without the intervention of the nervous system.

Experiment 1st. A solution of Corrosive Sublimate was introduced into the stomach of a rabbit, of which the nerves of the eighth pair had been cut: the effects of the poison were the same as if the nerves had not been divided.

Experiment 2nd. The nerves of the eighth pair in the neck of a rabbit were cut, and the spinal marrow was divided in the midst of the back; a solution of Corrosive Sublimate was injected into the abdomen: the action of the heart ceased at the same instant.

Experiment 3rd. A small quantity of Corrosive Sublimate was injected into the posterior part of the abdomen of a frog: five minutes after, the heart was no longer contracting, but the sensibility was not diminished; the animal was still somewhat sensible at the end of an hour. The effects of the poison were the same as those which would have resulted from the excision of the heart.

Experiment 4th. The posterior part of the spinal marrow was removed, in such a manner as that the communication of the nerves of the posterior extremities with the rest of the nervous system was completely cut off; a solution of Corrosive Sublimate was then injected between the skin and the muscles of the thigh and leg. The heart ceased to beat seven minutes after the injection of the Sublimate.

Experiment 5th. A solution of Corrosive Sublimate was injected into the abdomen of a rabbit, which was under the influence of the *Woorara*, (vide p. 293, part ii.) and in which

the circulation was kept up by artificial respiration. The heart ceased to act a short time after the injection, just as if the *Woorara* had not been administered; nevertheless, we have seen that the peculiarity of this poison is to destroy the sensibility of the nervous system.

Experiment 6th. The experiment was begun again with this difference, that the spinal marrow was cut in the neck; and the substance of the brain was destroyed by means of an instrument, before making the injection of the Sublimate into the abdomen, whilst the animal was already under the influence of the *Woorara*: the heart ceased to contract as usual.

1018. We shall here relate an observation of poisoning, by the external application of Corrosive Sublimate: it has been communicated to us by our friend *M. Cloquet, Aide d'Anatomie* to the Faculty of Medicine, and Professor of Anatomy: he expresses himself as follows:

OBSERVATION.

On the 22nd of May, 1815, about five in the evening, I plunged my hands several different times into a very concentrated solution of Corrosive Sublimate, for the purpose of taking out some anatomical preparations. I forgot to wash my hands, and went about my ordinary occupations. About eleven o'clock, I went to bed without experiencing any inconvenience. About one in the morning, I was awoke by very severe pains, which I felt in the epigastrium; these pains increased very rapidly, and became excruciating. Bending of the trunk eased them a little. They were more particularly felt in the region of the stomach, and seemed to extend over the whole of the diaphragm; the abdomen was somewhat depressed, and pressure was painful in the epigastric region. I felt a sense of constriction all over the breast. My breathing was costal, difficult, unequal; my pulse small, concentrated, irregular; my mouth dry, with tolerably ardent thirst; a copious sweat covered my forehead, temples, breast, and hands,

and I felt in these parts a coldness, which was very troublesome. After being in this state about half an hour, several eructations took place. To these succeeded nauseas; but I made useless efforts to vomit: it was only then that I suspected the Sublimate to be the cause of all these symptoms. I put my fingers into my mouth, and perceived by the acrid taste that I had forgotten to wash my hands, which I hastened to do at the instant; I drank in great abundance sugared water, and about two o'clock procured vomiting, that is to say, an hour after I awoke. The vomitings were at first very violent, and succeeded one another with great rapidity. The matter of the vomitings was glairy, thick, and had a metallic taste extremely acrid, which caused me a painful constriction in the throat. The epigastric region was extremely sensible to the touch, and the slightest pressure occasioned the most severe pains. The vomitings stopped towards half past four in the morning. I then felt some gripings in the umbilical region, and had three stools extremely fluid, and accompanied with tenesmus; about five in the morning I fell asleep, and woke about eight, with the mouth dry, and the skin covered with sweat; but I no longer felt the sensation of cold in the forehead, stomach, and hands; the sickness at the stomach had disappeared, but the epigastric region remained extremely painful. I took during the day only six plates of broth, and three of rice cream; the next day I was able to attend to my occupations: nevertheless, for eight days I preserved a sense of uneasiness in the epigastric region.

Artificial Cinnabar (Sulphuret of Mercury). In the dose of thirty-six grains or a drachm, it produces death in the course of two, three, or four days, when applied to the inside of the thigh: the stomach and intestines exhibit on dissection lesions similar to those we have described in the preceding article; the heart and brain do not appear altered; the lungs sometimes are found distended.

Sulphuret of Arsenic. *Hoffmann* and *Renault* have ad-

vanced the opinion that the native Sulphurets of Arsenic are not poisonous when introduced into the stomach. *M. Smith* has proved that they produce death when applied to wounds. One or two drachms of *native yellow Sulphuret*, when brought into contact with the cellular texture of the inside of the thigh of a dog, occasioned death at the end of two days; the stomach was evidently inflamed; the small intestines exhibited some wrinkles of a red colour. The *native red Sulphuret* has also occasioned death at the end of a few days. The *artificial red Sulphuret*, in the dose of one drachm, twenty-six grains, occasioned, three days after, convulsions, which were shortly after followed by death. There were found near the pylorus some ulcerations, black at the bottom: the interior of the rectum exhibited some red wrinkles and livid tubercles.

Acetate of Copper. This salt, applied externally, in the dose of one or two drachms, produced no accident at the end of seven days.

Verdigris. In the article, *Treatment of poisoning by Verdigris*, we have described the experiments made by *M. Duval* for the purpose of ascertaining the efficacy of sugar as an antidote to this poisonous substance: we have given also those which we have tried ourselves with the same intention, and we have come to the conclusion that sugar ought to be regarded as the antidote of Verdigris, an assertion which had been made several years before by *M. Gallet*, Ex-Apothecary-General to the armies. In examining the chemical action which sugar powdered is capable of exerting upon this salt, we found that the latter became decomposed; and we proposed to ourselves to study the phenomena and the results of this decomposition. (Vide vol. i. part i. p. 235.) We then undertook a chemical labour on this subject, and found that sugar, at the temperature of boiling, decomposed rapidly the solution of Verdigris, and converted it into a prot-oxyde of copper of an orange-yellow colour, and into acetic acid, which was set at liberty. Several vegetable substances, such as gum, certain oils, &c.,

effect the same decomposition. We communicated these experiments to the pupils attending our course, and repeated them in their presence. It was our intention to have published them, when we learned that *M. Vogel* had just presented to the first class of the Institute a very excellent memoir on this subject, and that the results he had obtained were conformable to our own. In reflecting on the phenomena of this decomposition, which only takes place with rapidity at the temperature of boiling water, we had great difficulty in conceiving how the sugar could decompose the Verdigris in the stomach; a circumstance essential to its being considered an antidote: in consequence of which we tried fresh experiments; being convinced by subsequent researches, that those we had already published were not sufficient to pronounce with certainty; because, according to our own maxim, the name of *counter-poison* cannot be given but to such substances as oppose the effects of the poison, *the œsophagus being tied*.

Experiment 1st. Fifteen grains of Verdigris were treated by boiling water, and mixed with six ounces of water saturated with sugar: the mixture was introduced into the stomach of a dog, and the œsophagus was tied. The animal experienced all the symptoms of poisoning, and died at the end of nine hours. The digestive canal exhibited an extensive inflammation, in every respect similar to what the Verdigris would have produced, if administered alone. The fluid contained in the stomach was analyzed, and it was ascertained that the salt of copper had not been decomposed, for it yielded a copious black precipitate with the hydro-sulphuric acid, a brown one with the prussiate of potash and of iron. This experiment was six times repeated with the same results.

Experiment 2nd. A strong dog was made to eat eight ounces of raw sugar; immediately after, twelve grains of Verdigris, dissolved in four ounces of water strongly charged with sugar, were introduced into the stomach: the œsophagus was tied. An hour after, the animal experienced already the

symptoms of poisoning: he was made to take six ounces of sugar dissolved in water; the symptoms acquired a greater degree of intensity, and death supervened two hours after the ingestion of the poisonous substance. The stomach and rectum were strongly inflamed, and the coppery salt had not been decomposed. This experiment was repeated five times, and furnished similar results.

Convinced by these facts, that sugar cannot be an antidote to Verdigris, we wished to know whether its administration would not be useful for quieting the irritation produced by this salt. To this end, several animals were made to take from eight to twelve grains of Verdigris, and they were left the power of vomiting; some of them were neglected, and died. To others were given a great quantity of sugar and sugared water divided into a number of doses frequently repeated, and very good effects resulted from it.

1019. It results from these experiments:

1st. That sugar exerts no chemical action on the Verdigris that has been introduced into the stomach; that it does not prevent it from acting as a caustic, and consequently is not its antidote.

2nd. That it is useful for calming the irritation produced by this poison, when it has been previously expelled by vomiting.

3rd. That the different instances of cures of this kind of poisoning which have deservedly given to the sugar the title of *specific*, are naturally explained, by taking into consideration that the Verdigris had been vomited, or had been taken in very small quantity.

The real advantages presented to us by albumine, in opposing the effects of corrosive sublimate, and the great facility with which this animal substance decomposes Verdigris, even at the ordinary temperature, induced us to try fresh experiments, which have been followed by the greatest success.

Experiment. The œsophagus of a robust dog of mid-

dle size was detached and perforated: thirty-six grains of Verdigris dissolved in three ounces of boiling water, and mixed with six whites of egg perfectly diluted in eight ounces of water, were introduced into the stomach:* the œsophagus was tied. At the end of five hours, the animal had passed several mucous stools, mixed with a substance of a greenish white colour, which was found on examination to be the precipitate formed by the albumine and the metallic oxyde. Five hours after, more stools. Five days after the operation, the animal had not experienced any remarkable phenomenon; he was somewhat dejected. The dejection increased on the two following days, and he died at the end of the seventh day. The opening of the body took place next day, and it was impossible to discover the least trace of alteration in the digestive canal. This experiment, repeated eight times, with doses of Verdigris which varied from twenty-eight to thirty-six grains, constantly gave the same results. The same thing took place when the metallic solution was first introduced, and a minute or two after, that of the albumine; in this case the animals made efforts to vomit. It is evident, that this dose of Verdigris administered by itself, would have produced death at the end of one or two hours, and that the stomach would be found highly inflamed; from which circumstances we ought to conclude that it was decomposed by the albumine, converted into a substance incapable of doing mischief, and consequently that this is one of its antidotes.

Should it happen, that a person has swallowed a strong dose of one of these soluble coppery salts, it will be necessary immediately to attempt its neutralization by means of albumine.† In case the quantity of the poison ingested should be very

* It was ascertained, by the prussiate of potash and of iron, that the solution of copper had been completely decomposed by the albumine, and that the whole of the oxyde was precipitated with the animal matter.

† All the soluble salts of copper are decomposed by this animal substance.

small, and there should be every reason to believe that it has been expelled by vomiting, sugar and its various preparations should be had recourse to: for the rest of the treatment, the principles laid down in the 1st Part of Vol. I. should be observed. (*Vide Art. Verdigris.*)

We have also made experiments with the prussiate of potash and of iron, a double salt which possesses the property of decomposing instantly the preparations of copper; the results were the same as with albumine; but as this double salt is not within the reach of every one, and as it may produce vertigoes when administered in a full dose, we recommend in preference the whites of eggs diluted with water.

Concentrated Acids and Caustic Alkalies. It was easy to foresee that these corrosive substances would not be absorbed when applied to the cellular texture: for this reason we have omitted to report in our first volume the experiments which we have made on this subject. The same thing happens with the Nitrate of Silver, butter of Antimony, Sulphate of Copper, and Calcined Alum.

Sulphate of Zinc. *M. Smith* has proved that the action of this salt is not uniform when externally applied. In the dose of thirty-six grains, it has destroyed animals; two drachms have not produced, on others of the same size, any thing more than vomitings, and some other symptoms, which have disappeared in the course of a few days.

Sulphate of Iron. This salt has exhibited to the same physician poisonous properties sufficiently energetic. When applied in the dose of two drachms to the cellular texture of the inside of the thigh of two dogs, it killed them in the course of twelve or fifteen hours. On opening the bodies, the internal surface of the stomach of one of them was found covered with a very great multiplicity of petechial spots. The wrinkles of the rectum were numerous and black; the liver whitish, with livid spots on its convex surface: the other exhibited a great quantity of black fluid blood in the stomach,

the membrane of which had contracted a livid colour from the presence of the blood; in other respects, no alteration or spot: a tolerably considerable quantity of the same fluid was found in the duodenum and small intestines, the mucous membrane of which was of its natural colour beneath; a very slight redness of the folds of the rectum; the heart contained black grumous blood, and some slight livid blotches in both ventricles.

When introduced into the stomach in the dose of two drachms, this salt did not occasion death in less than twenty-six hours, and without any other apparent symptom than a general insensibility; the interior of the stomach exhibited red spots, elongated; the small intestines presented blackish puffy swellings; the upper part of the rectum shewed red folds.

Muriate of Ammonia (Sal Ammoniac). This salt, which formerly entered into the composition of the *Lapis Infernalis* of *Fallopious*, and into the *Unguentum Cathereticum* of *Barbette*, is poisonous when applied externally. *M. Smith* applied to the cellular texture of the thigh of a small dog, one drachm and twenty grains of this salt. At the end of an hour and half, the animal experienced a sensible uneasiness; he was feeble, and vomited frothy mucosities. At the expiration of two hours, the weakness was so great, that he was scarcely able to support himself; he appeared to be drunk. Five hours after the application, he stood a little better on his feet; the vomitings had not returned, but the weakness increased, in such a manner, that he died twelve hours after the application of the poison: no vestige of it could be discovered under the skin of the limb operated on. The mucous membrane of the stomach exhibited towards its splenic extremity a multitude of small gangrenous ulcerations; the part corresponding to the pylorus was evidently inflamed; there was found throughout the whole digestive canal a blackish fluid extremely fetid; the rectum exhibited a red spot of no great extent; the heart preserved its natural consistence; in the left ventricle, were

three small red spots, which extended about a line into the fleshy texture; the anterior part of the lungs presented here and there some red spots.

Another dog died in thirty-six hours, in consequence of the external application to the thigh of two drachms of the muriate of ammonia. The mucous membrane of the stomach at its splenic extremity, was reduced to a state of putridity; pieces of this membrane were floating in a mucous fluid, which was in tolerable abundance; the small intestines and rectum, were just as in the preceding experiment: on the outside of the base of the right ventricle of the heart, there was a sanguineous effusion into the fat which divides it from the auricle; this effusion extended into the fleshy texture.

OF CHARCOAL, WHICH HAS LATELY BEEN CONSIDERED AS THE ANTIDOTE TO CER- TAIN MINERAL SUBSTANCES.

1020. We published, in an Appendix to the 2nd Part of the 1st Volume, numerous experiments, which demonstrated in the most rigorous manner, that Charcoal was not the antidote of corrosive sublimate, nor of the white oxyde of arsenic (arsenious acid) as *M. Bertrand* had pretended. In a Memoir recently printed, this physician persists in considering Charcoal as an antidote to these two metallic preparations, and he relates some observations which appear to him to prove, that it is equally so to verdigris.* This assertion did not at all surprize us, as *M. Bertrand* had said, in his first paper, that it is probable that Charcoal is the antidote to a very great number of metallic salts. We are of opinion, that it is extremely dangerous to propagate errors of so serious a nature; full of confidence of obtaining similar results, physicians may put in practice these inefficacious means, and lose much precious time, in

* *Journal Général de Médecine*, redigé par Sedillot, Avril, 1815, p. 363.

circumstances where there is not a moment to be lost. This has induced us to recur again to this topic, in order to demonstrate that *Charcoal* is not, nor can possibly be, the antidote to any metallic substance.

The word *antidote*, has, amongst many physicians, two different acceptations : at one time, they give that name to a substance capable of decomposing rapidly the poison in the stomach, and of forming with it a substance that is insoluble, and destitute of any action upon the animal economy ; at another time, they apply it to every medicine which, without any kind of power of decomposing the poisonous substance, diminishes the effects to which it gives rise, quiets the symptoms of the disease, and is even capable of putting an end to them altogether. It is unnecessary to shew how little the denomination of an antidote is applicable to these medicines. For instance, is it not absurd to say, that leeches are the antidote to corrosive substances, because they have frequently, when applied to the belly, put an end to the symptoms of inflammation which had succeeded to the ingestion of some corrosive poison ? And how many more instances of this kind could we not adduce ? But let us not dispute about terms : let us come fairly to the question, and prove the inefficacy of *Charcoal* as an antidote, whatever acceptance *M. Bertrand* may give to this word.

Charcoal does not possess the power of decomposing at the temperature of 32°, any of the three metallic preparations in question. The most simple reasoning is sufficient to demonstrate this proposition. Let us take for instance the arsenious acid (white arsenic). The most decidedly elementary works on chemistry teach us, that this acid is extremely volatile ; and that in order to decompose it by means of *Charcoal*, it is necessary to fix it by means of an alkali (metallic oxyde) or a soap, which contains soda or potash ; and beside, it is not until it has been heated to redness that this decomposition takes place. It is then impossible that this effect should take

place in the stomach. But, it may be said, the vital powers will supply the place of temperature and of alkali, the stomach is not a chemical vessel; and *M. Bertrand* must necessarily partake in this opinion, since he says in his last Memoir, when he is endeavouring to make it understood how Charcoal can possess the virtue of an antidote, “that this substance carries off by means of heat, the oxygen of the greatest number of bodies, reduces metals, and becomes oxydated at a low temperature.” (p. 369.) Since then this heat is insufficient, *M. Bertrand* must reckon upon the vital powers.

For too long a time, those physicians, who have too much neglected the study of chemistry, have obstinately persisted in having recourse to powers of this kind, whilst they stand for nothing in explaining the phenomena which they endeavour to understand. It is for them a very considerable resource, and frequently a word devoid of meaning. There is nothing to do here with the vital powers; the operation is entirely within the province of chemistry. Let any one introduce into the stomach of an animal six grains of arsenious acid, mixed with sixty grains of Charcoal, and three or four ounces of Charcoal-water; let them tie up the œsophagus, in order to prevent vomiting; and then let them analyze the fluids found in the digestive canal after death; they will find the arsenious acid, and not an atom of metallic arsenic; therefore the phenomena have taken place just as if the mixture had been made in an inert vessel, the temperature of which was the same as that of the stomach; *that is to say, that the Charcoal has not decomposed the poison.*

We might produce again the same arguments in regard to *corrosive sublimate* and *verdigris*.

Now let us consult experience. Not a single fact will be produced in which Charcoal or Charcoal-water had prevented the death of animals that had taken a sufficiently strong dose of one of these poisons, and whose œsophagus was tied: all, on the contrary, have died after experiencing the symptoms which

these poisons would have produced, had they been taken alone. We shall avoid giving the details of the numerous experiments which have enabled us to announce this important fact. How could that have taken place, if the Charcoal had effected their decomposition? Let us compare the results of these experiments with those we have obtained, by giving solutions of sublimate or verdigris with albumine, the muriate of tin with milk, the acetate of lead with a soluble sulphate, the nitrate of silver with the muriate of soda. Under all these circumstances the poison is decomposed in the stomach as at the ordinary temperature: so also the animals do not experience any of the symptoms of poisoning, they live several days, and only die from the effects of the operation and of hunger; the digestive canal in them exhibits no trace of inflammation, when the antidote has been administered in sufficient quantity.

*It is then proved, both by theory and experiment, that Charcoal does not possess the power of decomposing, at the temperature of 32°, any of these three metallic preparations, either in the stomach, or elsewhere.**

2nd. *Charcoal is not a medicine capable of diminishing the effects produced by corrosive sublimate, arsenious acid, and verdigris; it cannot cure the disease which they produce.* Physiology and pathological anatomy teach us, that the affection produced by these corrosive substances, is an inflammation more or less intense of the texture with which they have been brought in contact, an inflammation followed, or accompanied, by a lesion of the nervous system. Now, how long has Charcoal been considered as a specific for inflammatory diseases? In what work on Therapeutics do we see it flourishing amongst the antiphlogistics of the first order? These considerations already allow of raising doubts concerning the

* There is no occasion to state here, that in order to draw a similar conclusion, the poison must necessarily be a long time in contact with the pretended antidote, that is to say, that neither of them ought to be vomited, so that it is an indispensable measure to tie up the œsophagus.

utility of this medicine, in these kinds of diseases. But experience proves, in a manner incontestable, that it is not endued with any virtue. We have frequently given to animals, a dose of these poisons sufficient to produce death, in ten, twelve, fifteen, or eighteen hours; a short time after their ingestion, we caused them to take the powder of Charcoal, and Charcoal-water; we have repeated every quarter of an hour, up to twenty-five and thirty times, the doses of this medicine, without being able to obtain the least success. Indeed, we have succeeded in restoring the health of dogs, that had only taken a small quantity of poison, and which nevertheless exhibited symptoms of poisoning; but a mucilaginous emollient fluid has produced the same effect; and frequently even they have recovered their health, when not the least assistance has been given them; a proof that the dose of poison ingested, has not been sufficiently strong to produce death.

1021. It results from these facts,

That neither Charcoal, nor Charcoal-water, present any particular advantage in cases of poisoning by corrosive sublimate, arsenious acid, or verdigris, and probably the other metallic solutions; and that the whole of the facts on which M. Bertrand supports his opinion, as to the efficacy of Charcoal, is very far from being sufficient to carry conviction to a mind ever so little just.

1022. It would not be amiss to quote here the new observation which this physician brings forward in favour of Charcoal. In this observation it was not ascertained, by analysis of the fluids, that the poison existed, and they pronounce that the Charcoal has acted as an antidote! A case of poisoning is admitted, where frequently there is only an indigestion, a *cholera morbus*, or any other disease.*

* We think it ought to be observed, that observations similar to those reported by *M. Bertrand* in his last memoir, and to that published by *M. Sézane*, in the *Annales Chimiques de Montpellier*, were they even a thousand times more numerous, prove nothing for or against the question; they can

" On the 1st of February, 1815, at noon, *Madame B**** sixty-seven years of age, her daughter, thirty-nine, and her servant, of the age of twenty-two years, ate of a fricasseed fowl, which had been cooked in a saucepan badly tinned, with the water which had been boiled, and remained sometime in a coffee-pot of red copper, likewise deprived of its tin. Towards evening, and during the night, *Madame B****, and especially the young lady, who was of a decidedly delicate constitution, made vain attempts to vomit; they experienced the following symptoms; styptic taste and dryness in the inside of the mouth, thirst, severe pains of the epigastrium; gripings, followed by several whitish stools. The night was passed in this state, and without any suspicion as to the cause of the symptoms, which these ladies attributed to indigestion. The next morning, the symptoms of the evening before appeared more decided, and they acquired so great an intensity in the young lady, that she became a prey to general convulsions, a painful and tense swelling of the abdomen, and repeated faintings. *Madame* and *Mademoiselle B**** felt coppery eructations, and violent gripings, with tenesmus, and followed by greenish liquid stools. *M. Colier*, a surgeon, recommended infusions of tea, sugared and emollient fomentations to the belly, which were continued the whole morning without any success. At his second visit, being informed of the material

only be available, as far as they acquire a certitude, by analysis, that the poison has been swallowed, that it has not been entirely vomited, and that the pretended antidote has converted it into a substance incapable of doing harm. So likewise are we thoroughly convinced, that dogs, on whom all sorts of experiments may be made, and that can be hindered from vomiting, will furnish always results much more proper for illustrating discussions of this kind. The objections that may be made from the difference of organization between men and dogs, fall of themselves when it is recollected that it concerns corrosive substances which act chemically, and in the same manner on the organic texture, as may be demonstrated by comparing the symptoms, and, above all, the lesions after death, which they produce in these two species of animals.

cause of the symptoms, by a closer examination of the circumstances that could be recollected to have preceded them, and especially by an inspection of the saucepan, and of the inside of the coffee-pot, where he perceived here and there some remains of verdigris not dissolved, he proposed milk and oily medicines, which were not made use of, but were replaced by infusions of the flowers of the *Tilia* sugared, alternated with the tea, which had also the addition of sugar. From time to time, a few drops of the liquor of Hoffmann were given in turns with the liquid laudanum of Sydenham, on sugar. The fomentations were continued the whole day. On returning the 2nd of February, from my daily round, I was called in to the patients, whom I found in the following situation: the mother experienced a great deal of heat and dryness of the mouth, and along the whole course of the alimentary canal; a styptic metallic taste; a sense of heat in the epigastrium; frequent gripings, followed, at increasing distances, by liquid and greenish stools; a painful swelling of the abdomen, some anxiety, a general sinking, palpitations to which she is very subject; her pulse had but little re-action, and presented some irregularities. The servant girl, who was strong and vigorous, exhibited the same series of symptoms, with a more decided strength of pulse, and gripes which gave rise to stools more copious, and of the same nature.

“The young lady was likewise a prey to all this train of symptoms, with this difference, that she still felt coppery eructations, intolerable pains in the epigastrium and in the abdomen, without any stools; she experienced a violent headache, faintings, cold sweats; her countenance denoted an attack made on the radical powers of life; her pulse was extremely tight, small, and at times irregular.

“From all the information I had obtained, and the evidence of the above-mentioned symptoms, I became certain that I had to deal with a case of poisoning by verdigris.* I directed

* We must confess, after having made more than two thousand experi-

from that moment my attention to the employment of sugar in substance in a strong dose, or to the albumine formed of white of eggs, which had perfectly succeeded with me in my *zootomic* experiments, made in 1811 with this preparation of copper; but I was somehow *mechanically* led to have recourse to Charcoal. I prepared a strong solution of Charcoal of the walnut-tree, in eight ounces of water, in which I suspended half an ounce of the same powder well sifted, some sugar, and distilled water of orange-flowers. The mother took a spoonful of it every half hour, and the young lady every quarter of an hour. Madame B*** experienced a sensible effect, and manifest amelioration of all the symptoms mentioned, from the third dose of the mixture; and her daughter was so much relieved after the fourth, that she told me a few minutes after, *you have applied a balsam to my stomach*. I continued the same mixture during the night, but at longer intervals. These ladies enjoyed a tranquil sleep; and the mother passed a greenish liquid stool. The servant girl, not being willing to take the mixture in the evening, experienced, during the night between the 2nd and 3rd of February, severe gripings, accompanied with yellow and greenish liquid stools. Being perfectly resigned in the morning of the 3rd, to submit to the same treatment, she reaped from it, as well as the ladies, the most satisfactory success." (Page 363, Memoir quoted.)

We shall not attempt to refute *M. Bertrand*, when he asserts that the difference of the results obtained by us with corrosive sublimate and arsenic, depend on saline principles with a calcareous base contained in the spring-water, in which he had dissolved these substances, whilst we had effected this solution with distilled water. The solid arsenious acid does

ments on poisons, that these *data* do not appear to us sufficient to acquire that certainty which *M. Bertrand* speaks of; and we are of opinion, that the great Juridical Physicians of our times would be far from concluding before the tribunals, that there had been, in this case, poisoning by verdigris.

not decompose the salts of lime, dissolved in spring-water ; its deleterious action is not even diminished by its mixture with lime-water. (*Vide* the experiments we have published in the 1st part of Vol. i.) As to the corrosive sublimate, it continues to act, even when dissolved in water containing calcareous salts.

Oxalic Acid. We have classed this acid amongst the corrosive poisons. (*Vide* vol. i., part 2nd, p. 373.) We did not report the experiments we had tried in order to determine its effects on the animal economy, because they were similar to those of which we had given the details in the history of the sulphuric and nitric acids. The following important observation has been published since the printing of our 1st volume.

Miss. M. P. about forty years of age, swallowed, instead of sulphate of magnesia, half an ounce of *oxalic acid* dissolved in water. She felt immediately inexpressible pains in the belly ; the face became shrivelled, the pulse imperceptible ; she vomited a dark coloured fluid, passed a very copious liquid stool, and expired in forty minutes.

Opening of the body. The stomach contained twelve or fourteen ounces of a dark coloured fluid ; its mucous membrane, which was injected, and red throughout its whole extent, exhibited a considerable thickening, with patches ; the muscular coat was contracted, and exactly divided into two portions ; one cardiac, the other pyloric : the serous coat was also injected. The ileum was strongly inflamed a few inches from the colon : the colon was contracted throughout its whole extent, but without any appearance of inflammation ; considerable effusion of a limpid fluid between the arachnoid membrane, and the pia-mater, which formed between these two membranes a separation of nearly three lines. The medullary substance of the brain was whiter than usual, and the choroid plexus paler than what it mostly is in cerebral congestions.*

M. Hume has thought to be able to explain the death of

* *Bibliothèque Médicale*, tome xlvi ; October, 1814, p. 121.

this person by the decomposition of the phosphate of lime, which constitutes a part of the coats of the stomach. This chemical explanation is totally void of foundation, for it is a well attested fact, that the oxalic acid, when made to digest for an hour on phosphate of lime at the temperature of 40°, exerts no sensible action upon it. How greatly it is to be wished, that chemists would cease to make extravagant applications of the science they profess to medicine, and that they would confine themselves to the explanation of the phenomena which lie entirely within their own sphere; this would without doubt, be the most effectual method to persuade clinical physicians, that real advantages may be drawn from the study of chemistry.

OF THE *CURARE*.

The *Curare* is as celebrated in the Oroonoko as the *Ticunas* is in the valley of the Amazon. Both are used for poisoning the arrows. There are several species of the *Curare*; the strongest is that of Mandavaca, a village which unites the Oroonoko with the Rio-Negro, that of Vasiva, and that of Esmeralda. According to *M. de Humboldt*, to whom we are indebted for these details, the real *Curare* proceeds from a climbing plant called *Vejuco de Mavacure*, the genus of which he was not permitted to determine. It is the bark of the Mavacure, which contains this terrible poison. The juice of this bark is yellowish; it is concentrated by means of fire; when it has acquired the consistence of a syrup, they mix in with it the still more glutinous juice of the *Kiracaguero* tree, which is not poisonous, but gives more body and consistence to the *Curare*. This latter is of a blackish brown colour, and resembles opium. When it is well prepared, they keep it three or four years; but in general it is extremely active only when fresh.

The *Abbé Gilij*, in his history of America,* says, p. 353, that he has been an eye-witness of the surprising activity of this poison: the strongest animals die in a very short space of time, when wounded with arrows impregnated with the *Curare*. Its whole action, he adds, is exerted upon the blood, which it is believed to coagulate. It may be kept in the mouth without danger; it does no harm when applied upon the gums, unless they should happen to bleed, from some cause or other. A bird, stag, monkey, or any other animal, killed with the *Curare*, may be eaten with impunity. Diluted with water, this poison produces no symptoms, or at least its strength is found to be very considerably weakened; the moisture of the atmosphere equally produces this effect, and *Gilij* has observed, that the Indians put the arrows into their mouth in order to warm them before discharging them.

Oviedo, in his work entitled: *Sommario dell' Inde Occidentali*, chap. 78, says, "All the Christians are of opinion, that sea-water, with which they wash the puncture, is the best remedy that can be employed by those who have been poisoned by the *Curare*; some have been restored by these means, but it is the smallest number. *Gilij* says, that in Oroonoko the Spaniards employ with success, common salt and urine to combat the effects of this poison. *M. de Humboldt* believes also, that the muriate of soda is a powerful remedy in this species of poisoning.

There is beside another species of *Curare*, which the missionaries call *Curare Destemplado*, because it is weak. It is with it that they tip the arrows which they make use of for catching small monkeys. The animal, whose life they wish to save is scarcely hurt: he faints however from the effects of the poison, and they cure him by introducing muriate of soda into

* *Saggio di Storia Americana descritta dall' Abate Filippo Salvatore Gilij*, tom. ii. Roma, 1781.

the wound, and rubbing him with this salt. Unfortunately it is very scarce and very dear at Oroonoko.

The following are a few particulars communicated to us by *M. Humboldt*, with respect to some other poisons.

“ On the river of the Amazons, we have seen the poisons of Moyobamba, of Peca, and of Lamas. The strongest is that of the Indians, *Ticunas*, which is only the juice of a climbing shrub, of the island of Mormorotte, which has been concentrated by evaporation. It appears that all these poisons are derived from different climbing plants. In taking a drawing, during my stay at Guayaquil, of the fruit of the *Vejuco de la Peca*, which had just been sent me from the Amazon, I experienced a numbness in my hands, only from having handled the plant during the violent heats of these climates. The most celebrated antidote against the poisons of the river of the Amazons is sugar.”

OF THE LIGATURE OF THE ŒSOPHAGUS.

We have frequently had recourse, in our experiments, to this operation, because we have considered it indispensable to the obtaining rigorous results. A number of learned men, both Frenchmen and foreigners, in taking notice of the 1st volume of our work, have asserted, that an operation so painful must produce serious symptoms, and consequently that the results we have obtained, were not so conclusive as they were disposed at first to think them. But could we have devoted ourselves to such labours without being well assured, by rigorous experiments, of the influence of this operation? These have demonstrated to us, 1st. That the conclusions we have drawn, ought not to receive any modification on account of the ligature of the œsophagus. 2nd. That it is impossible to write a complete work on poisons, without practising it frequently.

EFFECTS OF THE LIGATURE OF THE ŒSOPHAGUS UPON DOGS.*

Experiment 1st. Four dogs of middle size, who had been refused food for two days, were operated on February 17th, at two in the afternoon: each operation scarcely lasted two minutes. At the end of an hour, these animals were as active as before the operation. On the 23rd, at ten in the morning, they had not experienced any remarkable phenomenon; they were only a little dejected. The next day, they appeared feeble, but still preserved the power of walking without staggering; their intellectual faculties were free, the pulsations of the heart somewhat weak. They died within the thirty-six hours which succeeded, without exhibiting the least convulsive movements. A few hours before death, they were lying down on the side, and were insensible.

Examination of the bodies. The ventricles of the brain contained no serosity; the external vessels of the right lobe were only a little distended with black blood; the lungs were of a fine rose colour, and presented on their surface a few brownish spots; the heart was somewhat softened, and contained coagulated blood; the mucous membrane of the stomach presented here and there a few spots of a rosy colour; there was near the pylorus a small ulcer of the size of a lentil, the edges of which were black; all the intestines were tinged yellow by the bile, but exhibited no lesion. The other organs were the same as in their natural state. These animals had remained eleven days without eating or drinking.

Experiment 2nd. A robust dog of middle size underwent

* It is unnecessary to observe, that we intend to speak here of the ligature of the œsophagus performed skilfully; in this case, it does not last longer than a minute, or a minute and an half. Certainly, the effects of this operation might be extremely serious, if, by ignorance or unskilfulness, the animals were tormented for fifteen or twenty minutes, before they had been able to effect it.

this operation the 11th of February, at ten in the morning: he had been fasting for two days. The next day, his pulse was somewhat accelerated, the pupils in their natural state, and he showed no vertigoes, paralysis, nor convulsive movements: so likewise he walked about as freely as before the operation. On the 13th, at three o'clock, he was in the same state, but had an ardent thirst. On the 14th, *fruitless efforts to vomit*, lying down *on the side*, great weakness, slight vertigoes, pupils in their natural state: death in the course of the night.

Inspection of the body. The stomach contained only a small quantity of yellow bile; the folds formed by its mucous membrane exhibited a violet colour, which is frequently met with in healthy dogs; between these folds were observed some rose-coloured spots; there was neither ulcer nor slough; the rectum was in its natural state, except that it exhibited here and there some red spots, which the scalpel removed by the slightest pressure; the rest of the digestive canal (except at the part operated on,) was sound. The lungs were crepitating; they were of a reddish colour, and contained a certain quantity of blood, especially towards the left lobe, the surface of which appeared black. The heart, brain, and other organs were the same as in the preceding experiments.

Experiment 3rd. This operation was performed on the 11th of February, at ten in the morning, upon a small robust dog that had been caught the evening before. The next day, the pulse was rather more frequent than before the operation. On the 12th, the animal began to be thirsty. The 13th, he walked about freely; the organs of sense and intellectual faculties in their natural state; slight dejection. The 17th, at three in the afternoon, lying down on the side; impossibility of supporting himself on his legs; slight convulsive trembling in the feet; inspirations excessively deep: he was dead two hours after. This animal exhibited no sign of paralysis nor vertigo during the seven days that he lived; he made no ef-

forts to vomit; the dejection went on increasing to the last moment.

Dissection. The mucous membrane of the stomach was tolerably red throughout its whole extent; it exhibited, near the pylorus, four ulcers of the size of small lentils; there were in the rectum a small number of red spots; the other portions of the intestinal canal appeared sound. The lungs were of a rose colour, somewhat deep, and contained only a very small quantity of blood; they were crepitating. The state of the heart, brain, and other organs was not different from those in the preceding experiments.

Experiment 4th. Six robust dogs of middle size were operated on the 22nd of March, at ten in the morning. Forty-eight hours after, they began to be somewhat dejected, but had not experienced any remarkable symptom. They were then hanged, that they might die in a state of *asphyxia*, and the bodies were opened an hour after. The stomach and intestinal canal *exhibited no sensible alteration*; the other organs exhibited the lesions which are found in bodies that have died of *asphyxia*.

1023. It results from these twelve experiments :

1st. That the ligature of the œsophagus in dogs constantly produces, during the two first days, nothing more than a slight fever and a little dejection, which is incapable of killing them in so short a time.

2nd. And that, if at this period, the animals be killed, no lesions will be discovered on dissection.

It is then evident, that an animal that has been made to take a poison a short time before the ligature is made on the œsophagus, and that should die in the course of the two first days, after having experienced serious symptoms, such as vertigoes, convulsions, pains, or insensibility, vomitings, &c., would not have experienced these symptoms but for the ingestion of the poison. What confirms the justice of this statement in a manner beyond all dispute is, that when there has been given

to other animals that have not had the œsophagus tied, an equal dose of the same poison, which has not been vomited, the same symptoms have taken place, the disease has advanced with the same rapidity, and the results have been identically the same. These comparative experiments may be made by giving *Nux Vomica*, Camphor, *Upas-Tienté*, *Angustura Pseudo-ferruginea*, and any other substance that is not vomited. It is, moreover, beyond all doubt, that all these alterations discovered after the death of animals poisoned that have had the œsophagus tied, and that die within the eight and forty hours after the application of the ligature, ought to be attributed to the poisonous substance, since the operation itself does not produce any during that period, except in the part operated on. Let any one judge, now, what influence the ligature of the œsophagus has been able to exert on the animals to which we have given poisons, and which died two, four, eight, twelve, or twenty-four hours after: now, this number comprises at least seven-eighths of those we have experimented upon.

3rd. That the fever and dejection increase during the third, fourth, fifth, and sixth days, and until the moment of death; that it happens sometimes during this interval, that vertigoes, and attempts to vomit make their appearance, and even some very slight convulsive movements; lastly, that after death there are discovered in several of the organs lesions more or less profound. However, frequently enough, the animals die in a state of great insensibility, without having experienced any of the above enumerated symptoms. It is certain, that in cases where the poison would act but slowly, it would be difficult after death, to determine whether the symptoms and lesions observed, depended on the poisonous substance, or on the operation. In this case, the operation of the œsophagus might lead one into error, and no confidence could be placed in the results furnished, only as far as the same effects could be obtained by administering the poison without tying the œsopha-

gus. This is precisely what we have done, every time such a circumstance presented itself: so likewise are we perfectly assured, that this element stands for nothing in the solution of the different problems we have endeavoured to resolve.

We are now about to prove *that this operation is indispensable, for studying a poison under all its relations.*

1st. If we are desirous of knowing the action that poisonous substances exert on the animal economy, we must necessarily bring them in contact with the stomach and cellular texture, compare the different phenomena they exhibit, and afterwards draw conclusions. Now, should this substance be of the number of those which are vomited immediately after their introduction into the stomach, how shall we observe their effects? Should we not be tempted to look upon it as but little hurtful, and expose ourselves to commit the most serious mistakes? How many facts could we not produce peculiar to ourselves, in favour of this assertion? But we shall give the preference to emetic tartar. Was the mode of action of this medicine so generally employed, known before our friend *Dr. Magendie* had forced the poison to remain in the digestive canal, by tying the œsophagus? The utility of this ligature for physiological researches of this kind, appears to us so evident, that we shall dispense with making any further remarks upon it.

2nd. That department of Toxicology relating to medical jurisprudence, likewise derives real advantages from the ligature of the œsophagus. How could we without this operation, determine the lesions of dead bodies, which certain medicines that most commonly are vomited, are capable of producing; but which, perhaps, in certain individuals happen not to be vomited?

3rd. But in no case does this operation become so necessary, as when the question is to ascertain the virtue of antidotes. We dare to assert, that this part of the science has only existed since the moment when the ligature of the œso-

phagus was put in practice. A medicinal substance can only be regarded as an antidote of any poison, inasmuch as that it acts upon it in the stomach, that it effects its decomposition, and that there results from it a production incapable of injuring the organization. Now, is it not by the assistance of this operation alone, that we can prevent certain poisons from being vomited, and oblige them to remain in contact for a greater or less length of time with the real or supposed antidote? Men of sound judgment will easily perceive the little exactness of the conclusions drawn by different writers, on the existence or non-existence of an antidote, that has been thrown up with the poison a short time after its ingestion; and they will agree, that the ligature of the œsophagus alone, is capable of preserving us from the errors that may be run into in this respect.

4th. We shall prove hereafter, that this operation is moreover indispensable for making the experiments, in which dogs are made to take the substances contained in the digestive canal of persons, who are said to have died from poison. How often has it not happened, in fact, that in making these animals swallow such substances as these by the mouth, that a portion falls into the trachea, and death takes place immediately, by reason of the asphyxia that they produce. Does it not also happen, when we have succeeded in introducing them into the stomach, that they are completely vomited; in which case, no result that is conclusive is furnished.

SECTION II.

OF POISON, GENERALLY CONSIDERED.

CHAPTER I.

OF THE PROPER MEANS FOR ASCERTAINING THE EXISTENCE OF POISONING.

ARTICLE 1st.

Of Diseases that might be confounded with Acute Poisoning.

1024. **I**N giving the history of the different poisons, we have remarked, that they all possess a common character, that of producing a series of symptoms more or less serious, a short time after their ingestion into the stomach, or their application to denuded surfaces; sometimes the symptoms follow very closely after the introduction of the deleterious beverage; sometimes several hours elapse before its effects can be distinctly ascertained. Now, since there are a very considerable number of spontaneous diseases, the invasion and symptoms of which resemble poisoning, and make their appearance often enough a few hours after a meal, it follows, thence, that ignorance, interest, or crime, may, under certain circumstances, confound, or seek to confound, one or other of these spontaneous affections, with the real case of poisoning, and compromise the safety, or even the life of the most respect-

• able persons. Alas! how often have we witnessed, even in our own days, processes of this kind altogether scandalous, in which have been seen men bearing the title of Doctor, drawing up with the most consummate ignorance extravagant reports, in which, with perfect *sang froid* they accuse the purest innocence, and hurry it to the scaffold. It is sufficient for these *soi-disant* physicians, in order to decide on the existence of poisoning, and even on the particular nature of the poison, to learn, no matter by how ill an observer, that a person has died suddenly, that he experienced vomitings or bloody stools, gripings, &c.; and that on opening the body, lesions have been found in the different organs. Completely ignorant of the numerous facts relative to the profound alterations of a number of the textures which have been frequently discovered after the sudden death of persons who have sunk under spontaneous diseases, they affirm confidently without any respect for the names of *Morgagni, Hunter, Boerhaave, Van Swieten, Bonetus, Lieutaud, Chaussier, &c.* How different is the conduct of wise and well informed physicians. Enlightened by a numerous series of observations, and by reading the great masters of the art, they examine attentively the phenomena of the disease which is the object of their research; they compare its progress and nature with all such as take place spontaneously at such and such a season; they take into consideration the age of the patients, their constitution, the climate they inhabit, the affections to which they are subject, the passions by which they are most frequently agitated. To these scrupulous inquiries they unite the regular inspection of all the organs; they describe with precision the alterations in their form, colour, texture; they collect the contents of the digestive canal, study carefully their physical properties; decide on their nature, by making numerous chemical experiments, and thus, supported by pathological anatomy, physiology, and chemistry, they arrive at rigorous conclusions, proper for bringing truth into broad day-light, and which alone are capa-

ble of serving as a basis on which the magistrates ought to pronounce their judgment.

1025. These considerations are sufficient to manifest the interest excited by the article on which we are now about to treat; so we shall endeavour to fathom it as far as in our power.

1026. The spontaneous diseases capable of being confounded with acute poisoning, are, *indigestion, cholera morbus, vomiting of black matter, black flux, putrid fever, &c.*

Indigestion, or diseases which take place shortly after having eaten or drank certain substances which are not generally regarded as poisonous. It frequently happens, that persons in very good health experience, a few hours after the meal, an irritation in the stomach and small intestines, gripings, nauseas, vomitings of matter of different colours, but which is sometimes greenish, and spasmodic constrictions. These phenomena are observed more especially in persons that are weak, and subject to pains of the stomach. *Schenkius, Zacchias, M. Fodéré*, and many authors, have observed grievous symptoms produced by indigestion; but the following fact ought to appear here, of which *Professor Chaussier* has given the details in a medico-legal consultation in favour of *Dominique François*, who was accused of being the author of a case of poisoning. (Vide p. 60.) The celebrated *Darcet*, father of the learned chemist of the same name, when arrived at the age of seventy-six, preserved all his faculties, and enjoyed good health; only for some little time since he felt at times, though rarely, flying pains in the stomach. On the 11th of February, 1801, he went to dine with one of his friends, M. B...: he spent, as usual, a part of the evening there, and was even more cheerful than usual. Returning home about eleven at night, he went to bed, and slept quietly; but, about four in the morning, he felt suddenly a violent pain in the stomach, which continued with a greater or less degree of intensity. Notwithstanding the employment of the different means which were

had recourse to, the patient was lying on the side, bent forwards, the limbs bent, and brought close to the trunk; his countenance was pale, the eye dejected, and yellowish; the pulse frequent, and tight; thirst excessive, the extremities cold, the hypochondria tense; there was an alvine evacuation, copious, and extremely fetid, which appeared to relieve him for a moment; at last, in an effort of expectoration, the throat filled up with a viscid serosity of a brownish colour, part of which flowed from the mouth, and he died, twenty hours after the invasion of the pain.

On opening the body, there was found in the abdomen a certain quantity of fluid effused, which proceeded evidently from the draughts which the patient had taken, and there was found in the stomach, near its great curvature, a round hole, the size of a lentil, surrounded by some other smaller ones. On examining the interior of this viscus, it was seen, at the place of the perforation, that the membranes which form the coats of the stomach, were destroyed for the space of about two *centimetres*, in such a manner that there remained only that which formed the external coat of this organ. There was found also, a little further on, a similar erosion of the internal membranes, and one or two of these erosions were circumscribed by a small whitish cushion, rounded, and slightly projecting."

M. Alexander Gérard says, that a young man between twenty and thirty years of age, who had taken nothing in the morning but a glass of wine and water and a few ounces of bread, experienced, all on a sudden, about four o'clock in the afternoon, so sharp a pain in the region of the stomach, that he was obliged to stop and bend down the body, squeezing the belly with his arms. All the medicines given were of no use, the patient died twelve hours after the invasion of the pain, and on opening the abdomen, there was found, in the small curvature of the stomach, about an inch from the pylorus, a hole about a line and half in diameter, as round as if it had

been made with a centre-bit; and this hole, which was surrounded by a red circle of the breadth of a quarter of a line at most, had allowed a passage into the abdomen of the different fluids which had been given to the patient. (*Mémoire sur les Perforations de l'Estomac*, par M. Alexandre Gérard, 1803.)

1027. We could relate a very great number more of cases of the same nature; but shall confine ourselves to speak of what has been well established, by the observations of *Bonetus*, *Morgagni*, *Lieutaud*, *W. Hunter*, *Lecat*, *Chaussier*, &c., that these eschars and perforations are capable of forming all at once, and of producing death in the course of a few hours, and that they may depend only on an internal cause.

1028. We have frequently confirmed a fact announced by *Hunter*, and which has some connexion with the object of this article; viz. that animals that have been caused to die of hunger, present, after death, a greater or less number of small ulcers in the stomach.*

* Some practitioners are of opinion, that in this sort of affections, the bile is decomposed, and acquires caustic properties. Without declaring in favour of this opinion, we can vouch for having made at various times a chemical analysis of the bile contained in the gall-bladder of persons that have died of severe bilious fevers, to which some physicians have lately given the name of *entero-mesenteric fevers*; we have constantly ascertained, that this fluid contained a greater quantity of resin than in its natural state; and that this had an acrid taste, pungent, and very hot; and it appears difficult to admit that such a fluid could remain in contact with our organs without inflaming or corroding them: for this reason also we are not far from reckoning it for something considerable, as a cause of the ulcerations and other lesions which frequently accompany these diseases.

Morgagni relates, that a child died of tertian fever, which, after extenuating him, brought him to the grave in the midst of terrible convulsions. His stomach contained a great quantity of green bile, which tinged the scalpel of a violet colour. The point of the scalpel, dipped in this fluid, became so venomous, that, two pigeons, wounded with this instrument, experienced violent convulsions, and died almost instantly. This bile was afterwards mixed with some bread, and some of it was given to a cock, which died

The Cholera Morbus. It sometimes happens, that persons of a bilious temperament, experience all at once a series of symptoms more or less serious, which may terminate in death, and which distinguish the disease we are now considering; these symptoms are vomitings of a various nature almost continual, in general bilious, of a green colour, or blue, or like lees of wine; dreadful pains of the abdomen, which particularly have their seat in the right hypochondrium, or in the epigastric region, accompanied often with a retraction of the abdomen; stools also bilious and copious; acid eructations, continual singultus, convulsions, vertigoes, delirium, cramps in the limbs, and particularly in the course of the tendons; the features of the face become decomposed, and there is a general prostration of strength; the pulse, which is small and accelerated, is sometimes imperceptible; the perspiration is suppressed, and cold sweats come on; the inside burns with heat, and the extremities are cold; the urine is turbid and rare. After death, it is observed, that the gall-bladder and *ductus choledocus* are distended; sometimes indeed, they are entirely empty; the duodenum and pylorus are frequently in a state of gangrene; the veins of the stomach are turgid; this viscus and the liver are in some cases inflamed; but the inflammation or gangrene never extends throughout the whole of the digestive canal; the bronchia are never inflamed.

The *Cholera Morbus* of which we are here speaking, is that which attacks a person suddenly, which consequently has no remarkable precursive sign; it may be excited by the ingestion of acid and cold drinks when the body is in a perspiration; by the sudden transition from cold to heat, or from heat to cold; by a violent paroxysm of rage; by the suppression of the menstrual discharge; by the repercussion of cutaneous diseases; by worms, and by a great quantity of food of difficult digestion. In general, it only takes place in the hottest months;

almost in as short a time as the pigeons had done, with the same symptoms, together with a trembling over the whole body.

however, a very small proportion of cases has been seen during cold winters.

Its progress is in general rapid; frequently the disease terminates at the end of a few hours; nevertheless, it has been known to last several days.

The termination takes place either by a speedy return to health, or by intestinal gangrene and death.

Of black Vomiting, and black Flux. We shall not attempt to decide whether in the black Vomiting, the stomach be the only organ affected, whilst in the black Flux it is the intestinal tube. It appears to us also totally unnecessary to establish the differences between what is called at the present day *hæmatemesis*, *intestinal hæmorrhage*, *melæna*; it is sufficient for us to know that under certain circumstances, black vomitings are observed, together with other symptoms which a person might be liable to confound with poisoning. This affection is described by Hippocrates, thus:*

“The patient at first throws up at every instant, and by regurgitation, fluids in tolerably great quantity, which are bilious or mucous, or like to saliva; then with them comes the food, which is very frequently vomited; at length, the matter thrown up becomes brown, bloody, similar to dregs, or to thick wine, or that which is already become strongly soured. When these evacuations are black, and appear to contain blood, their smell is fetid; they burn the pharynx, set the teeth on edge, and effervesce when they touch the ground. An uneasiness is felt after the vomiting, sometimes even before it takes place;† in some cases the patient feels himself somewhat relieved after vomiting; nevertheless, the stomach can neither remain empty nor full. In a state of emptiness, there are *borborygmi* and sour eructations; after the introduction of food, there is a sense of heaviness in the organs of digestion, a lancinating

* HIPPOCR. de Morbis, lib. ii. in fine.

† Debility, lipothymia, and anguish, are symptoms which most constantly accompany vomitings.

pain in the breast, back, and side. The more this disease advances, the more formidable it becomes; the body becomes lean, the *conjunctiva* puts on a greenish tinge; the skin assumes a pale yellow colour, becomes soft and flaccid: at length slight shiverings take place, and a small degree of fever, pains of the head, weakness of sight, heaviness of the legs, the skin is livid, and destruction continues constantly to advance. In spite of the employment of proper remedies, this affection is fatal, and carries off the patients in a short time."

M. Portal, who has published, in the *Mémoires de la Société Médicale d'Emulation*, some observations on the *melæna*, reports two cases occasioned by strong affections of the mind; another, which was the consequence of the impression of the gout upon the organs through which the *vena porta* distributes its ramifications, &c. &c.

It is evident, from what we have just said, that this affection cannot be confounded except with the poisoning produced by corrosive and acrid substances (the others hardly ever producing bloody vomitings): now, when bloody vomitings or stools are occasioned by the corrosive poisons, the blood thrown up is of a fine red colour, whilst in this case it is black; beside that, corrosive poisons for the most part produce a severe inflammation in the mouth, œsophagus, stomach, and the rest of the intestinal canal; whilst in the *melæna*, the intestinal canal is not affected generally: there is seen only an excoriation, a *phlogosis*, or an eschar, in one or other part of the alimentary tube. In general, it is seen, that on squeezing the mucous membrane of the stomach of persons that have died of this affection, a black matter similar to that vomited is made to ooze out; a circumstance which never occurs in cases of poisoning by corrosive or acrid poisons. Moreover, the *melæna* is frequently occasioned by a scirrhus of the stomach, or of some other part of the abdominal viscera.

We might say still more concerning certain *vomitings*, as *bilious*, *mucous*, &c. which are sometimes observed in hysteri-

cal women, in certain cases of nipping (*pincement*) of the intestines, and in some other cases; these vomitings are accompanied with other symptoms more or less severe, the whole assemblage of which might be confounded with poisoning, if due regard were not paid to the antecedent circumstances, to the history of the case, &c. We shall confine ourselves simply to mentioning this fact, in order to fix the attention of juridical physicians.

Malignant (ataxique) fever. If we reflect ever so little on the manner in which many poisons act on the nervous system, we shall be convinced that their effects imitate sometimes those which characterize the malignant fever, and consequently, that it is necessary to be extremely circumspect, if the poison has not been discovered, not to confound these two affections. This case is so much the more intricate, since the opening of the bodies, far from affording any light, may, under certain circumstances, increase the uncertainty of the practitioner called on to decide.

1029. After having pointed out the principal diseases which may be confounded with poisoning, we think we ought to lay down the precepts which the juridical physician ought to have at hand, in order to avoid mistakes which might prove fatal.

1st. He will pay attention to the season of the year, and to the prevailing diseases; for the *cholera morbus* for instance prevails commonly in the summer months, which are nearest to autumn, and during the autumn itself: so likewise there exists such a kind of medical constitution in which colics and vomitings become as it were epidemic.

2nd. He will study well the habits and former way of life of the patient; he will especially inform himself whether he was a valetudinarian, whether he had experienced some disease ill determined, or whether he might not have some concealed vice (a thing which frequently enough happens) it being less probable that a man, who in other respects enjoyed good health, should be all at once attacked with violent symptoms

from an internal cause, or at least, that he should die of it; nature alone, or assisted by art, generally getting the upper hand, when the subject is healthy and strong.

3rd. He will observe, whether the disease be with or without fever, for it rarely happens that symptoms occasioned by an internal cause are exempt from it, whilst that is very common in cases of poisoning, at least in the early stages of their action.*

1030. If the diseases we have just described, exhibit numerous relations with those produced by certain poisons, the same thing cannot be said of a multitude of others which careless observers have sought to confound with poisoning, and which are principally polypi, aneurisms, internal abscesses, congestions of blood in one of the principal viscera, *angina pectoris*, internal hæmorrhages, the rupture of certain organs, &c. It sometimes happens in these affections that death takes place suddenly. The physician who may be called in to decide on the true cause of an accident of this nature, will easily prove that it does not depend on the action of a poison, 1st, because death in these instances is never preceded by the symptoms to which poisonous substances give rise; 2nd, because on opening the dead bodies, he will discover serious lesions produced by the diseases we have just enumerated, lesions which never result from the action of a poison. In truth, no particular lesion would be discovered in the case where sudden death might have been occasioned by some strong passion, such as an excess of grief, or an excess of pleasure; but, in this case, the history of the case, and the absence of the symptoms which characterize poisoning would be sufficient to enlighten the juridical physician.

* FODÉRE, op. citat. tom. iv. p. 297.

ARTICLE II.

Of the means by the assistance of which we may attain to the knowledge of the nature of the substance which has occasioned the Poisoning.

1031. IN examining each of the poisons in particular, we have adhered to the task of making known their physical and chemical properties, in order that the practitioner might be able to distinguish them one from the other, the progress which mineral chemistry has made within these five and twenty years, has permitted us to trace the medico-legal history of mineral poisons with a degree of exactness, which would be sought in vain in those of the organic kingdom ; this branch of chemical science is yet in its cradle, notwithstanding the important labours of modern chemists. The major part of vegetable substances cannot be distinguished from one another but by the physical characters they possess : when submitted to analysis they have furnished almost constantly similar products, so that, in the present state of knowledge, the idea of establishing between them any differences by means of chemical tests must be given up. It is from these considerations, that, in the particular history of vegetable poisons, we have confined ourselves to the description of the botanical characters of the plants and those of the poisonous products they furnish. But if it were useful to point out in each particular description which we have given, the distinctive characters of each poison, it is still more important to lay down the precepts which ought to direct the juridical physician who may be called in to cases of poisoning. In fact, he may often arrive when no information is to be had on the nature of the deleterious substance, either because the patient is not in a situation to give any account of it, or because the assistants are completely ignorant of the circumstances of the case : would not the practitioner

expose himself to the risk of losing the fruits of his inquiries, if, in the examination of the suspected matters, he did not follow some methodical plan, more especially being obliged to make his choice out of so great a number of poisonous substances? How, for instance, could he possibly form a correct judgment, if he be obliged to proceed by means of multiplied blind attempts, at the analysis of a very small quantity of the suspected substance? Would not experiments blindly instituted, cause him to commit serious blunders, or at least would they not leave him in a state of perplexity likely to bring ruin on his reputation, and leave the question undecided? These considerations lead us to give to this article all the extent which it appears to deserve.

FIRST PROBLEM.

To ascertain the nature of the poisonous substance with which any one has been poisoned, when the whole of it has not been swallowed, and the remainder can be procured.

1032. The resolution of this problem may be effected by the assistance of three different orders of means; 1st. Those resulting from chemistry, and which constitute analysis; 2nd. Those belonging to pathology, and which have for their object the *symptoms*; 3rd. Those under the head of pathological anatomy, and which are capable of making known the healthy or morbid state of the organs.

§ I. CHEMICAL ANALYSIS.

1033. Amongst the great number of poisons of which we have treated, there are some which may present themselves in a solid form, others in a fluid form; lastly, some of them are in a state of gas.

SOLID POISONS.

1034. We should begin by inquiring whether the poison belongs to the organic or inorganic kingdom : to this end, a very small quantity should be placed upon a plate of iron, heated to an obscure redness. All those belonging to the organic kingdom will be decomposed, they will diffuse a smoke, the smell of which will be similar to that of sugar-candy, of vinegar, or to that of burning horn; and in general they will leave behind a residue of the nature of charcoal, more or less abundant : some amongst them, which are composed both of vegetable and mineral substances, such as the acetates of lead and copper, emetic tartar, &c., will give also, as the result of this operation, the metals or oxydes which enter into their composition. The inorganic poisons, when placed on a plate of iron heated to an obscure redness, will exhibit phenomena which are variable : some of them will be volatilized, will diffuse a pungent vapour, the smell of which will never be similar to those we have just been speaking of; others puff up; in fine, the greater part of them will undergo no alteration, nor will they, under any circumstances, leave behind a residue of the nature of charcoal.

If it has been ascertained, that the solid poison belongs to the organic kingdom, we must next endeavour to ascertain, by its physical properties, whether its nature be vegetable or animal. It may be asserted in a general way, that those substances which diffuse a smell of sugar-candy when decomposed by fire, are vegetable substances; but it cannot be affirmed, that those which, placed under some circumstances, exhale an infectious smell of horn, are animal substances; for there are found in the vegetable kingdom, a certain number of substances which might be called *animalized*, which contain a great quantity of azote, and which give out a similar smell, whilst undergoing decomposition.

1035. If the organic substance on which this first experiment has been made, exhales an odour of sugar-candy, and it be in the form of a powder, or crystals of a white or bluish colour, we must endeavour to discover, whether it be emetic tartar, oxalic acid, tartaric acid, acetate of lead, acetate of copper, or verdigris; these are, amongst the poisonous vegetable substances that can be well distinguished by chemical tests, those which are the most commonly found in commerce. To this end, a small quantity of it must be dissolved in distilled water, and some sulphuric acid poured into the solution.

This Acid precipitates.

Emetic Tartar.

Acetate of Lead.

This Acid does not precipitate.

Oxalic Acid.

Tartaric Acid.

The solutions of Acetate of Copper, and of Verdigris.

1036. Should the sulphuric acid have produced a precipitate, a soluble hydro-sulphate (*hydro-sulphuret*) should be poured into another portion of the solution: the emetic tartar will be precipitated of a reddish orange colour +, the acetate of lead of a black +.*

In the case where the sulphuric acid should not furnish any precipitate, a few drops of ammonia should be poured into the fluid, which would precipitate the solution of copper, and impart to it a tinge of blue +; whilst nothing of the kind would be produced in solutions of the tartaric and oxalic acids.

The oxalic acid may be distinguished from the tartaric, by the following characters:

* We employ the sign+ to designate that the poison is recognized, and consequently that it will not be brought again into the list. Suppose then, that a black precipitate has been obtained by the hydro-sulphate, which indicates a salt of lead, it will then be necessary to employ the remainder of the solution in order to confirm, by means of the re-agents pointed out, Vol. ii. part 1st, Article *Lead*, that it is in reality a salt of this metal: the juridical physician would be very blameable, and might be led into error if he neglected to make these ultimate experiments.

1st. It leaves very little charcoal when exposed upon a plate of metal, of an obscure red heat; the tartaric acid on the contrary, leaves a great deal.

2nd. The oxalic acid decomposes the solution of sulphate of lime, with which it gives a white precipitate; the tartaric acid does not disturb this salt.

SOLID INORGANIC SUBSTANCES.

1037. When by this method it has been ascertained that the solid substance belongs to the inorganic kingdom, a certain quantity of it is to be taken, and to be dissolved in *distilled water*, which should be made to boil for a quarter of an hour, should the solution not have been effected by the cold water.

The portion to be dissolved should always be in proportion to the disposable quantity; but, in the general way, the half should be acted upon, for it is with the solution that the characters proper for recognizing the poison are obtained. It is needless to state that the quantity of distilled water varies also according to that of the substance to be operated upon, its solubility, &c.; but, in general, as little as possible of this fluid should be employed, in order to have the solutions more concentrated.

Substances soluble in Water wholly or in part.

1. Corrosive Sublimate.
2. Arsenious Acid (white Oxyde of Arsenic).
3. Muriate of Antimony.
4. Sulphate, Muriate, and Nitrate of Copper.
5. Muriate of Tin.
6. Sulphate of Zinc.
7. Nitrate of Silver crystallized, and Lunar Caustic.
8. Muriate of Gold.

Substances insoluble.

1. Red Precipitate or Oxyde of Mercury.
2. Black Oxyde of Mercury.
3. Turbith Mineral, or Sub-deuto-sulphate of Mercury.
4. Red and yellow Sulphurets of Arsenic.
5. Peroxyde of Antimony.
6. Kermes, Golden Sulphur.
7. Peroxyde of Tin.
8. Oxyde of Zinc.

Soluble Substances.

9. Nitrate of Bismuth.
10. Potash, Sub-carbonate of Potash.
11. Soda, Sub-carbonate of Soda.
12. Sub-carbonate of Ammonia.
13. Barytes, Muriate and Nitrate of Barytes.
14. Lime.
15. Nitrate of Lead.
16. Nitrate of Potash.
17. Sulphate of Iron.
18. Muriate of Ammonia.
19. Sulphuret of Potash.*

Insoluble Substances.

9. Sub-Nitrate of Bismuth (*blanc de fard.*)
10. Carbonate of Barytes.
11. Carbonate of Lead.
12. Cinnabar.

EXAMINATION OF THE SOLUBLE SUBSTANCES.

1038. After having determined that the substance is soluble, either wholly or in part, the fluid should be carefully filtered, and labelled to prevent it being confounded with the others: we will designate it by the name of the fluid *A*. A small quantity of it should be put into an experiment-glass, and a few drops of hydro-sulphate of potash, soda, or ammonia (hydro-sulphurets) should be poured into it: this re-agent will form precipitates in some of these solutions.

Solutions which are precipitated by the Hydro-sulphates.

Corrosive Sublimate, black.
Muriate of Antimony, orange or red.

Solutions which are not precipitated by the Hydro-sulphates.

Arsenious Acid.
Potash, Sub-carbonate of Potash.

* Amongst these substances soluble in distilled water, there is only the muriate of antimony, a variety of the muriate of tin, and the nitrate of bismuth, that are not wholly soluble; the rest dissolve in it extremely well, unless they be very impure. In truth, the arsenious acid is but little soluble, and requires a greater quantity of fluid than the rest, and an ebullition kept up a much longer time. It is unnecessary to observe here, that we have included in this table, only the solid poisonous substances which are most common.

*Solutions which are precipitated by the
Hydro-sulphates.*

Soluble Salts of Copper, black.
 Muriate of Tin . { black or chocolate or yellow.
 Sulphate of Zinc . { yellowish white, or deep brown.
 Nitrate of Silver and Lunar Caustic { blackish brown.
 Muriate of Gold, deep chocolate.
 Nitrate of Bismuth, black.
 Sulphate of Iron, blackish-green.
 Nitrate of Lead, black.

*Solutions which are not precipitated by
the Hydro-sulphates.*

Soda, Sub-carbonate of Soda.
 Sub-carbonate of Ammonia.
 Barytes, Muriate and Nitrate of Barytes.
 Lime.
 Nitrate of Potash.
 Muriate of Ammonia.
 Sulphuret of Potash.

1039. Having ascertained that the solution is precipitated by the hydro-sulphates, the precipitate should be ticketed, and its colour noted : then a fresh quantity of the fluid *A* (§ 1038) is to be poured into another glass, and caustic alcoholized potash, dissolved in distilled water, added to it.

Solutions which yield a white Precipitate with Caustic Potash.

Muriate of Antimony.
 Muriate of Tin.
 Sulphate of Zinc.
 Nitrate of Bismuth.
 Nitrate of Lead.

Solutions which yield with Potash coloured Precipitates, or are not precipitated at all at the ordinary temperature.

Corrosive Sublimate, canary yellow+.
 Salts of Copper, blue+.
 Nitrate of Silver, deep brown+.
 Muriate of Gold : no precipitate cold+.
 Sulphate of Iron, green or red+.

1040. Amongst the solutions which give a white precipitate to the alcoholized potash, there is one which is capable of being decomposed by the muriatic acid (*hydro-chloric*): a little of the solution *A* then (§ 1038) should be poured into another glass, and a small quantity of this acid added to it.

*Solutions which precipitate by the
Hydro-chloric (Muriatic) Acid.*

Nitrate of Lead+.

Solutions which do not precipitate.

Muriate of Antimony.

Muriate of Tin.

Sulphate of Zinc.

Nitrate of Bismuth.

1041. The solutions that do not precipitate with the hydro-chloric acid, should be treated with distilled water: to this end, another glass should be taken containing a little of the fluid *A* (§ 1038), and a tolerably large quantity of distilled water should be added to it.

Solutions which give a White Precipitate with distilled water, or become milky.

Muriate of Antimony+.

Nitrate of Bismuth+.

Solutions which undergo no alteration.

Muriate of Tin.

Sulphate of Zinc.

1042. Amongst the solutions that are precipitated, that which has already furnished with the hydro-sulphates (§ 1038) a black precipitate, is the salt of bismuth+; that which had precipitated of a yellowish orange, is the muriate of antimony+.

1043. If the solution has not been altered by the water, the oxyde should be separated from it by potash; it should be washed and heated with the nitric acid: if the oxyde dissolves in this acid, it may be concluded that it did not belong to a salt of tin+; if it dissolves there, every thing leads to the conclusion that it formed part of a salt of zinc+: to be sure of it, the poison should be examined as has been directed, Vol. I. Part 2nd Art. *Sulphate of Zinc*.

1044. If we now return to the solutions that have not furnished any precipitates with the hydro-sulphates (§ 1038), we see that there are some which turn the syrup of violets green; which will be ascertained by taking a fresh quantity of the fluid *A*.

*Solutions which turn the Syrup of
Violets green.*

Potash, Sub-carbonate of Potash.
Soda, Sub-carbonate of Soda.
Sub-carbonate of Ammonia.
Barytes.
Lime.

Solutions which do not.

Arsenious Acid.
Muriate and Nitrate of Barytes.
Nitrate of Potash.
Muriate of Ammonia.*

1045. Among the solutions which have turned the syrup of violets green, there is the sub-carbonate of ammonia, which may be instantly eliminated, because it diffuses a pungent odour of volatile alkali; the others will be divided into two sections by the *solutum* of sub-carbonate of potash, which precipitates two of them.

*Solutions which precipitate by the Sub-
carbonate of Potash.*

Barytes.
Lime.

*Solutions which do not precipitate by
this Re-agent.*

Potash, Sub-carbonate.
Soda, Sub-carbonate.

1046. If the solution has been precipitated by the sub-carbonate of potash, a fresh quantity of the fluid *A* should be taken, and sulphuric acid poured into it.

The barytes will be precipitated +. The lime will not +.

1047. If the sub-carbonate of potash has produced no precipitate, some muriate of platina should be poured into a fresh quantity of the fluid *A*, which will precipitate of a canary-yellow, the potash and sub-carbonate of potash +, and which will not precipitate the soda, nor the sub-carbonate of soda +.

1048. Supposing the solution has not turned the syrup of violets green, it should be treated with lime-water, or by hydro-sulphuric (*hydro-sulphurated*) water.

These Re-agents precipitate.

The Arsenious Acid, white and yellow +.

These Re-agents do not precipitate.

Muriate and Nitrate of Barytes.
Nitrate of Potash.
Muriate of Ammonia.

* We omit to speak of the *sulphuret of potash* dissolved, because it is easily known by the smell of rotten eggs which it diffuses.

1049. If the solution is not precipitated, some sub-carbonate of ammonia should be poured into another portion of the fluid *A*.

This Re-agent precipitates

The soluble Salts of Barytes.

This Re-agent does not precipitate

Nitrate of Potash.

Muriate of Ammonia.

1050. In order to distinguish the nitrate of potash, from the muriate of ammonia, quick lime in powder should be added. The first of these salts will undergo no alteration + ; the muriate of ammonia will be decomposed, and will disengage ammonia, easily recognizable by its smell +.

1051. Let us suppose now, that the poisonous substance is not dissolved in distilled water (§ 1037): regard must be had to its colour.

*Solid poisonous substances insoluble of
a white colour.*

Peroxyde of Antimony.

Peroxyde of Tin.

Oxyde of Zinc.

Sub-Nitrate of Bismuth.

Carbonate of Barytes.

Carbonate of Lead.*

*Solid poisonous substances insoluble,
coloured.*

Red Precipitate, or red Oxyde of Mercury.

Black Oxyde of Mercury.

Turbith Mineral, yellow.

Sulphurets of Arsenic, yellow or red.

Kermes, brown-red.

Golden Sulphur.

Cinnabar.

1052. If the substance be white, a portion of it should be brought in contact with the pure nitric acid, which will dissolve a certain number of them.

* When these substances are pure, they are constantly of a white colour ; it may however happen, that they are a little coloured by some metallic oxydes ; but that would never be to such a degree as to confound them with those which we have denominated *coloured*, the colours of which are very decidedly marked.

<i>Substances soluble in pure Nitric Acid.</i>		<i>Substances insoluble in pure Nitric Acid.</i>
Oxyde of Zinc,	} without effervescence.	Peroxyde of Tin.
Sub-Nitrate of Bismuth,		Peroxyde of Antimony.
Carbonate of Barytes,	} with effervescence.	
Carbonate of Lead,		

1053. If the solution in nitric acid has been effected without effervescence, some distilled water should be poured into it: that of the nitrate of bismuth will be precipitated of a white colour +; that of the nitrate of zinc will undergo no alteration +. In the cases where it has been effected with effervescence, it should be placed in contact with pure ammonia: that of lead will furnish a white precipitate +; that of barytes will remain transparent +. Nevertheless, we again repeat it, the precepts we have given are only indications; it will be essentially necessary to ascertain whether these different fluids possess the other properties which we have described in giving their chemical history. (*Vide* vol. 1. Part 1st and 2nd.

1054. If the solid substance of a white colour should be insoluble in the nitric acid, it should be dissolved in the hydrochloric (muriatic) acid: the peroxyde of tin would furnish a hydro-chlorate, which would not be precipitated by distilled water, whilst the solution of the peroxyde of antimony would yield with this fluid a white precipitate in very great abundance +.

1055. Let us suppose now, that the solid poisonous substance insoluble in water is coloured (§1051): it will be seen whether it be of a red colour.

<i>Red substances.</i>	<i>Substances of other colours.</i>
Red Oxyde of Mercury.	Black Oxyde of Mercury.
Cinnabar.	Turbith Mineral, yellow.
Red Sulphuret of Arsenic.	Yellow Sulphuret of Arsenic.
Kermes, brown-red.	Golden Sulphur.

1056. Amongst these red substances, there are two that do not dissolve in the hydro-chloric (muriatic) acid.

Red substances soluble in the Hydro-Chloric Acid.

Red Oxyde of Mercury.
Kermes, brown-red.

Red substances insoluble in this Acid.

Cinnabar.
Red Sulphuret of Arsenic.

1057. The red oxyde of mercury dissolves in it entirely without heat, and rapidly; the solution is not decomposed by distilled water +. The kermes on the contrary, does not dissolve rapidly but in part; there is disengaged a smell of rotten eggs, and the solution furnishes a precipitate with water, white, or of an orange colour, according as it has been effected +. (*Vide* vol. I. Part 1st, page 188.) If it be required to distinguish the cinnabar from the red sulphuret of arsenic, or the two other red powders, the dried powder must be heated in a small glass tube, with the solid caustic potash; the cinnabar will give out mercurial globules +, and the sulphuret of arsenic, metallic arsenic +.

1058. If the substance be not of a red colour (§ 1055), and should be black, there would be strong reason to suspect that it is the black oxyde of mercury; in that case we may be assured of it by means of the hydro-chloric (muriatic) acid, which would not dissolve it, but would combine with it, and convert it into calomel of a whitish colour (muriate of mercury at minimum, sub-chloruret of mercury). But if it should be of a yellow or orange-yellow colour, it may possibly be turbith, golden sulphur, or yellow sulphuret of arsenic (orpiment); in that case, in heating it to redness in a small glass tube for a few minutes, the turbith would give out metallic mercury +; the others would not be decomposed; but, on treating them with the hydro-chloric (muriatic) acid, the sulphuret of arsenic would remain without dissolving, whilst with the golden sulphur, there would be formed muriate of antimony soluble and capable of being precipitated by water.

POISONS FLUID OR DISSOLVED.

1059. Here, as in the case of solid poisons, the first thing to be done is to decide whether the fluid poison belongs to the inorganic or organic kingdom. Amongst the poisons of the organic kingdom, there are hardly any other than vegetable substances about which we need make inquiry. Now, these substances are in general coloured, whilst the greatest part of the fluid inorganic poisons are of a white colour: the former are frequently odorous; the latter almost always inodorous: the taste of the former is acrid, bitter, or astringent; the inorganic poisons have a saline, acid, or styptic taste. Left to themselves, the fluid vegetable poisons become decomposed, corrupt, and diffuse an infectious smell; the others undergo no alteration: lastly, on evaporating vegetable fluids, they furnish a solid production which decomposes on a plate of metal heated to an obscure red, in the same manner as we have stated § 1034; which character prevents them from being confounded with those of the inorganic kingdom.

The number of poisons of the inorganic kingdom, which are capable of presenting themselves in a fluid form, is very considerable. In fact, there exists, independently of those we have stated as being soluble in water, several acids and certain other bodies that are commonly in the fluid state; nevertheless the solution of this part of the problem presents no difficulties, when the details we have just entered into are called to mind. We should begin by pouring two or three drops into an experiment glass, in order to determine whether the poison reddens *strongly* the tincture of tournesol, and is precipitated by ammonia.

Fluid Poisons which constantly redden or destroy the Tincture of Tournesol, and are not precipitated by Ammonia.

Acid Sulphuric.

—— Sulphureous.

—— Nitric.

—— Nitrous.

—— Hydro-chloric (Muriatic).

—— Phosphoric.

—— Fluoric.

Chlorine (Oxygenated Muriatic Gas).

Hydro-sulphuric Acid (Sulphurated Hydrogen).*

Fluid Poisons which do not redden the Infusion of Tournesol, or redden it slightly; but, in this case, are precipitated by Ammonia.

Corrosive Sublimate.

Arsenious Acid.

Muriate of Antimony.

Soluble Salts of Copper.

Muriate of Tin.

Sulphate of Zinc.

Nitrate of Silver.

Muriate of Gold.

Nitrate of Bismuth.

Potash, Soda, Sub-carbonate of these bases.

Sub-carbonate of Ammonia.

Barytes, soluble Salts of Barytes.

Lime.

Soluble Salts of Lead.

Nitrate of Potash.

Sulphate of Iron.

Sulphuret of Potash.

1060. We need only occupy ourselves about the fluid poisons, which redden or discolour the infusion of tournesol, and which are not precipitated by ammonia; for the others are precisely the same as those we have just been studying, § 1037. Three of these poisons may easily be eliminated, because they diffuse a smell generally known; these are, the sulphureous acid, the smell of which is like burning sulphur +; the hydro-sulphuric acid (sulphurated hydrogen), which disengages a disagreeable smell of rotten eggs +; lastly, chlorine, the smell of which is suffocating, and which, far from reddening the infusion of tournesol, destroys it, and turns it of a yellow colour +. As to the rest, they are to be treated with lime-water.

* We say nothing of Ammonia, it being very easily recognized by its smell.

Those which precipitate by Lime-Water.

Phosphoric Acid, which does not corrode glass+.

Fluoric Acid, which corrodes glass to that degree, that it must of necessity be kept in metallic vessels+.

Those which do not precipitate by this re-agent.

Acid Sulphuric.

— Nitric.

— Nitrous.

— Hydro-Chloric (Muriatic).

1061. Amongst the fluid poisons which do not precipitate by lime-water, there are some, that are rapidly decomposed by metallic copper.

Those which are rapidly decomposed by Copper without heat.

Acid Nitric+.

— Nitrous+.

There is an effervescence and disengagement of orange-yellow vapours.

Those which are not without heat.

Acid Sulphuric.

— Muriatic.

1062. It is unnecessary, for the juridical physician, to point out the distinction between nitric and nitrous acid; the sulphuric acid cannot either be confounded with the muriatic; for it precipitates abundantly of a white colour the water of barytes in the least possible state of concentration+, whilst the muriatic acid causes in it no precipitate when diluted+.

GASEOUS POISONS.

1063. If we should be called upon to determine the nature of a Gaseous Poison which had produced fatal effects, we must proceed according to the following precepts, supposing, what is not improbable, that the deleterious gas is one of the following: chlorine (oxygenated muriatic gas), nitrous gas, ammonia, hydro-sulphuric acid (sulphurated hydrogen), sulphureous acid, protoxyde of azote, azote, carbonic acid, oxyde of carbon.

1064. It should be examined whether it has any colour or not :

Coloured Gases.

Chlorine, greenish-yellow+.

Nitrous Acid Gas, orange-yellow+.

Colourless Gases.

All the others above-named.

1065. We then pay attention to their smell.

Gases having a very strong smell.

Ammonia, smell of Volatile Alkali+.

Hydro-Sulphuric Acid, smell of rotten eggs+.

Sulphureous Acid, smell of burning Sulphur+.

Gases inodorous, or very little odorous.

Protoxyde of Azote.

Azote.

Carbonic Acid.

Oxyde of Carbon.

1066. For the inodorous gases, or those having little smell, a bell should be filled with them, and a lighted taper introduced.

The protoxyde of azote would cause it to burn with great energy+.

Azote would extinguish it, and would not precipitate lime-water+.

The carbonic acid gas would likewise extinguish it, but would produce a white precipitate in lime-water+.

The oxyde of carbon would take fire, burn with a bluish white flame, and the residue of the combustion would precipitate lime-water+.

§ II. *Of the information to be drawn by the Juridical Physician from the Symptoms of the Patient.*

1067. We have often combated, in the course of this work, the opinion of those physicians that think they can recognize, by the examination of the symptoms, the nature of the poison ingested : the facts we have made use of to refute this assertion are so numerous and striking, that it appears to us unnecessary to dwell longer on this subject. Nevertheless,

we do not pretend that it is of no use to make an attentive examination into these symptoms; on the contrary, we are perfectly convinced that they may, under certain circumstances assist in determining to what class the poison under investigation belongs. It is clear, that if the six classes of poisons, which we have adopted, were well made, that is to say, if they present characters proper to distinguish them constantly from one another, and if each one contained substances, the action of which on the animal economy was nearly the same; it is evident, we assert, that one might, by the aid of these symptoms, refer a poison to the class to which it belongs; but these conditions in several instances are wanting, which proves that the classification is far from being perfect. Meanwhile, until this part of the science shall have made the progress which we have a right to expect from the able men who cultivate it, we shall lay down certain considerations which appear to us sufficiently important.

Phenomena which may cause a suspicion that the Poison belongs to the Class of Acrid or Corrosive Substances.

In general these poisons have an acrid, hot, burning taste; they produce a constriction in the throat, and an extraordinary dryness in the mouth and œsophagus; they produce violent vomitings of different kinds of matter, mixed sometimes with blood; pains of the abdomen, particularly in the epigastric region; frequent stools. These symptoms are in a short time followed by such as characterize inflammation of the mucous and serous membranes of the stomach and intestines. In the general way, these poisons do not give rise to vertigoes, nor to paralysis of the abdominal limbs, unless they have been employed in a very strong dose, or the person be extremely susceptible; and, when these symptoms do take place, it is in the beginning of the disease. In general, the patient preserves the use of his intellectual faculties during the first periods; but, a short time before death, he falls into a state of great in-

sensibility and immobility, and is agitated by convulsive movements.*

Phenomena which might excite a suspicion that the Poison ingested belongs to the Class of Narcotics.

The poisons of this class have no caustic taste; their action on the mouth and œsophagus is different to that we have just described; they produce no pains shortly after their ingestion; they rarely occasion vomitings, and when these do take place, they are less obstinate than those produced by the corrosive and acrid poisons; the stools are also more rare; but they frequently give rise, shortly after their ingestion, to *vertigoes*, and *paralysis of the inferior extremities*: there exists a great propensity to sleep, stupor, coma, and the intellectual faculties are perverted, the pupils dilated; in general, the limbs are agitated with slight convulsive movements; sometimes, however, these movements are strong, especially towards the end of the disease, then there is acute pain.

Phenomena which may excite a suspicion that the Poison ingested belongs to the Class of Narcotico-Acrids.

In this class there are some substances that present nearly the same symptoms as the narcotic poisons, except that they are preceded by a slight degree of excitement; but there are a very great number, such for instance as Camphor, *Cocculus Indicus*, *Nux Vomica*, the different species of *Strychnos*, the *Angustura Pseudo-Ferruginea*, that have an intolerable bitter taste, and which, a short time after their ingestion, give rise to horrible convulsive movements; the limbs become excessively stiff; they are agitated in every direction; the person

* The quantity of the poison swallowed has a great influence on the nature and intensity of the symptoms. Thus, for example, three animals, which shall have taken different doses of corrosive sublimate, will present, before dying, symptoms very widely different; so that we should be very much embarrassed to determine any thing with precision on this head.

falls down, his breathing is suspended through the immobility of the thorax; the eyes are starting out of their sockets; the tongue, gums, and mouth, exhibit all the signs of asphyxia. These phenomena continue two, three, or five minutes, then the patient appears almost in the natural state; he is able to walk about for some time, until he falls under the influence of a fresh attack. This circumstance never happens in cases of poisoning by the Narcotics. In fact, the substances of this class produce no paroxysms, the symptoms continue till death.

§ III. *Of the information to be drawn by the Juridical Physician from the State of the Organs after the Death of Persons poisoned.*

1068. Before describing the alterations of texture produced by the different classes of poisons, we shall lay down the precepts which ought to serve for a guide in the opening of dead bodies. These precepts are extracted from the learned lectures of *Professor Chaussier*. We will begin by the opening of the thorax.

Opening of the thorax and neck. A longitudinal incision is to be made, which extends from the superior part of the sternum, to the base of the *xiphoid* cartilage; then two others are made, one superior, transversal, which follows the direction of the clavicle, and terminates near its *acromian* extremity; the other inferior, which, from the base of the abdominal appendage of the sternum, follows the cartilaginous contour of the ribs, and terminates near the projecting extremity of the fourth false rib. All the fleshy parts must be detached, which are applied over the anterior surface of the thorax; the flaps are turned back on the ribs, and the ribs and sternum are sawed through, directing the instrument from below, upwards, and in the direction of a line, which would extend obliquely from the extremity of the fourth false rib, to the superior part of the sternum, a little below the clavicles, taking care not to force the saw too deep, to avoid wounding any of the larger veins.

All the ribs must be successively cut through, except the first and the two last; the sternum is to be raised up; it should be turned down from the upper part upon the abdomen, and kept in that situation. The pleura and lungs are to be inspected; these last must be taken out by introducing the hand into the cavity of the thorax, the edges of which are previously covered with the folds of a napkin, to prevent excoriating the fingers; the œsophagus and aorta enveloped by the dorsal portion of the mediastinum, should be carefully considered; lastly, the pericardium, the heart, auricles, ventricles, great vessels, and the blood. These different organs are to be opened, and it will be sometimes observed, that they are more or less red in their interior, and even in their exterior, a phenomenon which is particularly observed in certain species of sudden deaths, and in all those affections in which the blood remains fluid: it depends essentially on the kind of death, and on a particular alteration of the blood, or on the body not having been opened till a long time after death, and ought not to be regarded as a consequence or proof of inflammation.

If there be blood, or any other fluid effused into the thorax, it should be collected with a fine sponge, and expressed into some vessel.

In these kinds of researches we must beware of attributing the brownish colour exhibited by certain parts of the lungs to lesion from any kind of foreign body: it depends evidently on the situation in which the patient died, and especially on that in which he was when he grew completely cold. In fact, as the blood stagnates in the vessels of the portion of the lungs corresponding to that part on which the body lies, the colour of that part ought necessarily to be browner.

Opening of the mouth, larynx, and trachea. The head should be placed in such a manner, that the fore part of the neck be well on the stretch and elongated; a longitudinal incision should then be made in the direction of the symphysis, which should divide the thickness of the lower lip, and

extend to the top of the sternum; another should then be made to follow the contour of the base of the lower jaw: the skin should next be detached, and the platysmamyoides muscle, until we come to the lateral parts of the neck; the maxillary bone should be sawed through upon the symphysis, and all the parts adhering to its internal surface should be cut; the tongue and adjacent parts are to be depressed, and by that means the *isthmus faucium* is brought in view. The pillars of the *septum staphylinum* are to be cut on each side, and the whole extent of the pharynx is discovered; the incision must then be prolonged downwards, and on the sides, when the œsophagus is easily found, which can be followed upon the bodies of the dorsal vertebræ, provided that the thorax has been previously opened.

In order to examine the trachea, it will be necessary first to separate the thyroid (gland), clean away with a sponge the blood that may have been effused into the trachea, and to make, from below upwards, a longitudinal incision, which should be continued to the *os hyoides*, dividing the larynx. If the bronchia are to be examined, the remaining portion of the sternum must be removed, together with the subjacent veins; to accomplish which, a portion of the clavicle and of the first rib, on each side, is to be divided with a saw.

Opening of the abdomen. The incision which had terminated near the extremity of the fourth false rib, should be prolonged on each side, and directed to the *crista ilii*; from there it is to be continued, turning it a little above the groins, as far as the *os pubis*; the sternal segment of the thorax must be strongly raised up, and the portions of the diaphragm that are inserted into it, cut through, together with the whole thickness of the abdominal muscles, as well as the umbilical ligament of the liver: this great flap is then turned down upon the thighs: on the interior edge of the diaphragm an incision should be made from sixty to eighty *millimetres* in length, which should be directed obliquely to the left. The costal

edge of the liver must be raised up, in order to view its concave surface, the gall-bladder, and a portion of the stomach; this viscus must be depressed with the hand, and drawn towards the right side, in order to perceive a portion of the spleen: the gastro-colic omentum is to be raised up and divided, to see the pancreas and posterior surface of the stomach; this must be turned back on the side of the thorax, and the intestinal canal and mesentery are to be examined; this last must be divided longitudinally, in order to decide on the state of the vessels situated on the bodies of the lumbar vertebræ; lastly, there remain to be examined the *glandulæ supra-renales*, the kidneys, ureters, bladder, and internal and external organs of generation: after which, the digestive canal should be detached in the manner we have described, Vol.i. Part i. p. 72.

If the coats of the stomach or intestines shall have been perforated, it will be necessary to absorb with a sponge, which should be squeezed out into some vessel, the fluids contained in the abdomen; after which, ligatures should be passed above and below the perforations, then the whole intestinal mass should be removed.

These researches being finished, every part of the body should be replaced in their former situation; all the incisions should be sewed up with large stitches; the body should be washed and wiped, and enveloped in a large sheet, upon which the magistrate ought to fix his seal. The cavity from which the viscera have been taken, should never be filled with bran, ashes, or lime; no portion whatever of the body ought to be carried away, unless indeed from an indispensable necessity of making further researches; and, in that case, it ought to be intrusted to no one, and should be placed in a vessel well stopped, after being enveloped in linen. The poisonous substances ought to be divided into two parts: one is to be preserved in pure alkohol, the other to serve for making the experiments proper for determining its nature. These experiments ought to be made in the presence of the magistrate ap-

pointed to this office, who ought to shut up the portions destined for examination, and place a seal upon them in case it should be necessary to pursue the researches. It will be necessary to verify the integrity of the seal before going on with the experiments that are begun.*

1068. If now we cast a glance on the lesions of texture which the different poisons produce, we shall perceive that it is not always easy to establish from them constant characters sufficient for determining the class to which they belong.

LESIONS OF TEXTURE PRODUCED BY CORROSIVE OR ACRID POISONS.

In general these poisonous substances excite an inflammation which extends from the mouth to the duodenum, but which is more manifest in the stomach; not unfrequently the *intestinum rectum* is found also inflamed, though the other portions of the intestinal canal are in their natural state. In other cases the inflammation spreads through the whole extent of the digestive tube: this inflammation varies with respect to its intensity: sometimes the textures are of a clear red colour, without any trace of ulceration; sometimes of a cherry red, or of a deep red, with longitudinal or transversal patches of a blackish colour, formed by extravasated blood; and sometimes there are ulcerations and sloughs. But it has happened

* It sometimes happens that it is necessary to open the cranium, in order to ascertain the state of the cerebrum, cerebellum, and the meninges. In this case, after shaving off the hair, and raising up the pericranium, the *calvaria* is to be taken off. For this purpose the trepan is to be four times applied, twice in front, once on the right side, and once on the left, upon the edge of the frontal bone which articulates with the parietal; and twice behind, near the mastoidean angle of the parietal bone; after which, the cranium is to be sawed through, following a line which, from the middle of the *os frontis* and a little above the orbits, extends circularly round the cranium, passing upon the occipital bone, a little below the superior arches.

in certain cases, that the poisons of this class have produced death after having been swallowed, without occasioning the smallest lesion: such was the case with that young girl spoken of by *Etmuller*, who died after having taken arsenic. We have frequently observed the same phenomenon on giving to animals very strong doses of corrosive sublimate, which have destroyed life in a very short time.* *M. Marc* relates, that in a case of poisoning by arsenic, instead of finding any erosion of the membranes of the stomach, they were found to be thickened. Be it as it may, it will always be right, in the examination of the lesions of the texture of the digestive canal, to follow the precept given by *Baillou*, which consists in examining them scrupulously, by placing them between the eye and the light: in fact, by this means, the smallest holes have sometimes been discovered, which had escaped the simple inspection of the organ.

We have confounded under one title the lesions produced by the corrosive poisons, and those resulting from the action of the acrid substances, because we are persuaded that it is impossible to distinguish them.

We regard as nothing those distinctive characters given by juridical physicians, viz. 1st. The separation of the villous coat (mucous membrane) of the stomach from the muscular coat, which, according to them, takes place when a corrosive poison has been swallowed, and which does not exist when the person has taken an acrid one. In fact some of the poisons of both these classes produce this alteration, and frequently it is not produced by either of them. 2nd. The facility with which the inflammation developed by corrosive poisons extends to the neighbouring organs, and to the skin; whilst this phenomenon does not exist with acrid substances.

* We purposely omit to speak of the lesions of the other organs, because we feel persuaded that they are frequently the same as those produced by poisons of the other classes; perhaps we may here except the lungs, which appear to be more particularly affected by the narcotic poisons.

It is evident that when these last are extremely energetic, they ought to produce the same lesions, which circumstance moreover is frequently wanting, even in the corrosives.

LESIONS OF TEXTURE PRODUCED BY THE ASTRINGENT POISONS.

These poisons, which especially comprize the preparations of lead, produce the same lesions as the corrosives when ingested in great quantity. (*Vide* Vol. 1. Part 2nd, page 475.) If the poisoning has happened from *Saturnine Emanation*, then a contraction in the diameter of the intestines is observed.

LESIONS OF TEXTURE PRODUCED BY THE NARCOTIC POISONS.

We have never discovered the slightest trace of inflammation in the digestive canal of animals killed by the poisonous substances which we have arranged under the class of Narcotics; some authors, however, pretend the contrary. It is always true, that this case is extremely rare, and, in some instances, the inflammation may be the consequence of the irritating fluids administered for the purpose of causing vomiting, or opposing the effects of the Narcotic. But if the digestive canal be not the seat of any inflammation, the lungs present almost constantly livid, and even black spots; their texture is more dense and less crepitating. We are far, however, from giving this character as sufficient to distinguish the narcotic poisons; for it is frequently met with in poisoning by the narcotico-acrids, and even in poisoning by the corrosive and acrid substances.

Shall we notice, as certain juridical physicians, the alteration of the face, the state of the eyes, which are half open, the extraordinary distension of the stomach and intestines, &c.; characters which have been pointed out as sufficient to dis-

tinguish the poisoning by narcotic substances? These signs are common to a very great number of poisons of the other classes, and consequently are more likely to lead into error, than to enlighten. We are far also from admitting, that the bodies of persons who have died by the effects of a Narcotic, putrefy constantly in a very short time: that their limbs are flexible, and the blood fluid. How many times have we not observed, in opening these bodies, four and twenty, or six and thirty hours after death, that putrefaction was not more advanced than usual; that the limbs were as stiff as in such as had been poisoned by substances of another class; lastly, *that the blood was coagulated?* How in this case can the red, livid, and violet spots be formed, which appear on the surface of the skin, which have also been improperly given as a character of this kind of poisoning, and the formation of which has been attributed to the speedy putrefaction, and to the great fluidity of the blood, which was extravasated and oozed through the pores?

LESIONS OF TEXTURE PRODUCED BY THE NARCOTICO-ACRID POISONS.

The poisons of this class may be divided into two sections, with regard to the state in which the digestive canal is found after death; some of them produce inflammation, accompanied sometimes by ulceration: such are the *Belladonna*, *Stramonium*, the different species of *Hemlock*, *Alkohol*, &c.; the others do not inflame: of this number are the *Nux Vomica*, *the bean of St. Ignatius*, &c. This consideration may be of great use in distinguishing the poisons of this class of narcotics, more especially when combined with the information furnished by the symptoms. In fact, let us suppose, that after the ingestion of a poisonous substance, there should appear signs of excitement followed by vertigoes, paralysis of the inferior ex-

tremities, &c., and that after death, the digestive canal is found to be inflamed, it is to be presumed, that the poison ingested belongs to the Narcotico-acrids, because the Narcotics do not produce inflammation in this canal. The poison will moreover belong to the Narcotico-acrids, if the animals have been strongly excited, agitated by violent convulsive movements, with symptoms of asphyxia; if there have been lucid intervals, after which fresh paroxysms took place;* lastly, that no inflammation is discovered in the digestive canal. Guided by these observations, we have frequently determined in animals, to which of these two classes the poison belonged. Nevertheless, there are facts which prove, that in this class, as in that of the corrosives, the signs drawn from the lesions observed after death, are liable to lead into error. Thus, for instance, it is well known that the leaves of the *Nerium Oleander* inflame the texture of the stomach when they remain there several hours. *Morgagni* relates an observation in which the juice of these leaves produced death, and the digestive canal was not found inflamed. “A poor woman, sixty years of age, wearied of life, and who had already attempted to drown herself, swallowed a tolerably large quantity of the juice of the leaves of the *Nerium Oleander* in some wine. Three hours after, she had violent vomitings, syncopes, and lost her speech; the lips were black, the pulse small, feeble, tense; at length she died at the end of the ninth hour. The body was of a violet colour posteriorly, from head to foot; the anterior part was in its natural state; there was no meteorism; the abdomen and breast preserved a little heat, although seventeen hours had elapsed since death: the blood-vessels of the stomach, intestines, and omentum, were very much distended; the stomach contained a certain quantity of a greenish fluid; its membranes appeared sound; the posterior surface of the

* It may however happen, that the animals die at the end of the first attack, when the dose of the poison has been considerable.

right lung was red and adhering ; the left lung was shrivelled ; all the other viscera were in their natural state.*

1069. It results from all that we have said relative to lesions of texture ;

1st. That the corrosive, acrid, astringent, and a part of the narcotico-acrid poisons, occasion almost always inflammation in one or more parts of the digestive canal, when swallowed in a sufficient dose ; that the same thing does not take place with the narcotic, and a part of the narcotico-acrid poisons.

2nd. That it is nevertheless certainly proved, that, under certain circumstances, some of the corrosive and acrid poisons have produced death, without leaving the slightest trace of alteration in the digestive canal.

3rd. That the juridical physician called in to a case of poisoning, cannot deny its existence on that ground only, that the digestive canal exhibits no lesion, as the poisoning may have been produced by the narcotics, narcotico-acrids, &c.

4th. That in case a person, who has died suddenly of severe symptoms, should exhibit the digestive canal inflamed, corroded, ulcerated, &c., the introduction of some poison may be *suspected*, but cannot be *affirmed* ; as we have asserted, that several severe spontaneous diseases might resemble poisoning during life, and the dead bodies would present lesions similar to those produced by the corrosive poisons.

5th. That in general, the lesions of the lungs, brain, heart, and other organs, may be the result of too great a number of causes, to make them serve as proofs of poisoning.

6th. That the juridical physician can only decide on the actual existence of poisoning, inasmuch as he may have proved in a manner incontestable, by chemical analysis, or by its physical properties, the existence of the poisonous substance itself.

7th. That in case he should suspect the poison to have been

* *Morgagni de Sedibus et Causis Morborum*, Epist. lix. No. 12.

in too small a quantity to be discovered; that there should exist serious lesions in the digestive canal, and that all appearances favoured the belief of the person having been poisoned, he ought to confine himself to declaring to the magistrate, that there are probabilities in favour of the poisoning, but that he cannot prove its existence.*

1070. We have just examined all that relates to the lesions of the dead bodies of persons poisoned; we have supposed that the opening of the body has taken place a few hours after death; but it may happen that we may be obliged to set about it fifteen, twenty, thirty, or forty days after their interment. In this case, they may be putrefied, and exhibit spots

* It is of great importance, in the examination of lesions of the digestive canal, not to confound the red or violet colour which appertains to inflammation, with that which depends sometimes on a peculiar kind of drink, or on some other cause. The following observation is calculated to throw a light on this subject.

“ A private person of Châlons-sur-Marne, who was in a state of convalescence from a disease under which he had laboured, took a slight purgative, in consequence of which he died suddenly. He was believed to be poisoned by the effects of a *quid pro quo* of the apothecary, and in order to be assured of this, the body was opened. The œsophagus and stomach in fact were found to be red, and as it were livid, in certain places, that is to say, in a state of apparent gangrene. This was at first adhered to, and the patient was looked upon as evidently poisoned. However, *M. Varnier*, a physician of Châlons, who was not the same as had attended him during his illness, knowing the correctness and prudence of the apothecary who had prepared the purgative medicine, made farther reflections, and arrived at the proof that his death was the consequence of the disease, and that the apparent convalescence was only an insidious respite. But it was necessary to give some account of the state of the œsophagus and stomach; and having learned that the deceased was in the habit of using a strong infusion of red poppies, the idea struck him that the extraordinary colour of these organs might possibly depend on this infusion: in order to assure himself of it, he caused a dog to swallow, for some time, a similar infusion; afterwards, having opened the body, he discovered that the same parts of this animal had put on the same colour as had been observed in the deceased we are speaking of, and this violet red colour was so firmly fixed, that it resisted the action of many and repeated washings.” (*FODERE, Médecine Légale.*)

of a violet colour, or black, or some other alterations which would not have been discovered if the opening had been effected a short time after death. In cases of this kind, the practitioner cannot be too circumspect, and he ought not to decide till after having paid attention to the sound or corrupt state of the body, to the season, variations of temperature, &c. &c.

SECOND PROBLEM.

To determine the nature of the Poisonous Substances with which any one has been poisoned, when it has not been swallowed entirely, and is mixed with Tea, Wine, or other alimentary substances.

1071. If at the bottom of the drink there be found any substance either in powder or crystals, the fluid should be decanted in order to separate them, and all the experiments we have described in § 1037, should be made on the solid portion. In fact, it may happen that a poison has been dissolved with heat in some drink, and has subsided on cooling, or that it has not been entirely dissolved without heat.

1072. In case the sediment should not prove poisonous, a portion of the fluid should be examined by the re-agents, in the manner we have described when speaking of poisons in solution, § 1060; and if, after making the suitable experiments, such precipitates should be obtained as are proper for recognising it, it may be concluded, that poisoning has taken place. But if the re-agents furnished precipitates different to those pointed out in the preceding problem, it would still be imprudent to conclude that the fluid in question is not poisonous. In fact, how many times have we not demonstrated that, *by their mixture with alimentary substances, poisons lose the power of furnishing with these re-agents precipitates similar to those which they exhibit when pure.*

Before drawing any conclusion, it will be necessary to introduce this fluid into a retort, to which a receiver is adapted; to heat slowly this retort until the liquor be reduced to half, to determine the nature of the volatilized portion,* and to examine, whether after cooling, there be not formed a sediment either in powder or crystals, which should be analyzed as above described.

If the fluid remained transparent, it should be put into a capsule, and evaporated to the consistence almost of a syrup, in order to obtain, under the form of a powder or of crystals, the solid poison that may chance to be found in solution: it should then be examined in the manner we have directed in the first problem. If, in spite of these different operations, it should prove impossible to obtain it under this form, it may be supposed, either that it has been decomposed, and converted into a kind of *magma*, or that it is of a vegetable nature.† Then a part of the product should be evaporated to dryness, and calcined in a small glass tube (described in Vol. 1st, Part 1st.) with pure potash and charcoal. If globules of mercury should be obtained, it may be concluded, that the poison is mercurial: it would be arsenical, if instead of globules, it should become volatile, in the form of brilliant plates like steel, possessing all the properties of metallic arsenic. In cases where this calcination throws no light upon the nature of the poison, the process should be begun over again, by putting the mixture into a small crucible, which must be kept at a red heat for some time. By this means a brilliant metallic substance would be obtained at the bottom, the nature of

* It may be conceived indeed, that there are a certain number of poisons which ought to pass into the receiver; such are ammonia and the sub-carbonate of ammonia, nitric acid, hydro-chloric (muriatic) and sulphureous acids.

† In fact, almost all the mineral poisons, which we have taken notice of in this work, are solid salts which, having been dissolved in any fluid whatever, ought to pass into the solid state by evaporation, at least unless they have been decomposed by the alimentary substance.

which should be determined by the process we are about to describe, after having enumerated the metals which might possibly be the object of these researches. These metals are, beside arsenic and mercury, which are supposed to be already eliminated, antimony, copper, tin, bismuth, zinc, silver, gold, lead. The metallic substance is to be treated by pure nitric acid, which should be heated; five of these metals will be dissolved by the acid; copper, zinc, bismuth, silver, and lead: two would be converted into a white oxyde; tin and antimony: gold would undergo no decided alteration.

Nitrates formed by the Metal and the Nitric Acid.

Nitrate of Copper, blue+.

Nitrate of Zinc.

Nitrate of Silver.

Nitrate of Bismuth.

Nitrate of Lead.

} white.

Oxydes formed by the Metal and the Oxygen of the Nitric Acid.

Peroxyde of Antimony.

Peroxyde of Tin.

The colourless nitrates will be easily distinguished; in fact, that of bismuth is the only one which gives a copious white precipitate with distilled water+; there is only that of lead which gives a white precipitate with the sulphuric acid *extremely diluted*+; that of silver gives, with lime-water, potash, or soda, an olive brown precipitate+; whilst that of zinc gives a white precipitate with all these alkalies+. As to the two oxydes of tin and antimony, they should be dissolved in the hydro-chloric (muriatic) acid, and the solutions should be treated by distilled water, and by the hydro-sulphates; the water would produce a white precipitate with the muriate of antimony+, and would not disturb that of tin; the hydro-sulphates would give a reddish orange precipitate with the salt of antimony, and yellow with the salt of tin.

1073. It is evident, that in the solution of this problem, the same conclusions might be drawn from the symptoms and lesions observed after death, as those we have already described in the preceding problem.

1074. The same steps ought to be pursued in the case where *the poison has been swallowed wholly, and nothing can be acted upon except the matter vomited, and what may be found in the digestive canal after death.* In this last case however, the analysis of the texture itself ought to be made, if all the researches on the solid and fluid aliments shall have proved fruitless.

ARTICLE III.

Of Experiments on Living Animals, considered as a means proper for ascertaining the existence of poisoning.

1075. It is a generally received opinion that, amongst the different means employed for deciding on the existence of poisoning, the causing dogs to swallow the fluid found in the stomach of persons who are supposed to have died from poison, deserves to be preferred before all others. If the animal die, it is said, or experience grievous symptoms, it is a proof that poisoning exists; whilst at the same time, no such thing has happened if no severe symptoms shall have taken place in the animal. This opinion has prevailed from time immemorial; it has been supported by men little versed in chemistry, who have avoided, under frivolous pretexts, compromising their reputation by seeking to analyze the fluids; it has also found partisans amongst enlightened physicians who have felt the impossibility they experienced of determining the nature of vegetable poisons, and who have consequently recommended the trial to be made, whether the matter contained in the stomach of a person supposed to have died by poison would occasion a speedy death to animals in good health.

On the other hand, some juridical physicians have raised their voices against such experiments, as being liable to lead the magistrates into error, and cause *them* to commit enormous blunders in *their* decisions. In fact, they say, supposing that

these experiments have been well made, might it not happen, that the person has been attacked by one of those spontaneous diseases in which the animal fluids become altered, contract a remarkable acrimony, acquire a poisonous property, and necessarily occasion the death of the dogs to which it may be given? Would it not be absurd, under these circumstances, to decide that the person had been poisoned? But how frequently they add, have the conclusions drawn from these kinds of experiments proved incorrect, because the experiments themselves had been badly made? Animals have been forced to swallow fluids by no means deleterious; nevertheless, these animals have expired a few minutes after, because the fluid had flowed through the larynx into the lungs; under other circumstances, extraordinary motions, resembling convulsions and extreme agitation, have immediately followed the ingestion of this kind of drink; phenomena which have been attributed to a poisonous substance, whilst they frequently depended on the efforts which had been made to retain these animals, on the rage into which they were thrown, or on some peculiar susceptibility. These considerations have induced us to undertake a few experiments on this subject, with the intention of determining the precise value of an experiment so generally accredited. The following are the results of our labour.

1st. In the case where the suspected substance at the disposal of the practitioner shall have been analyzed in a suitable manner, the remaining portion ought to be introduced into the stomach of a small robust dog, that is fasting; but the practitioner must take care not to make him swallow it, or put it into his food, as has been hitherto the practice. In fact, not only would he run the hazard of losing, by this proceeding, the greatest part, because the animal would reject it, but the food with which it is combined might exert upon it some chemical action, and decompose it to such a degree as to change entirely its nature. Beside, it would happen, at least six times

out of ten, that a part of it would flow through the larynx into the lungs, and the animal would die of asphyxia.

2nd. The best method that can be employed, consists in detaching the œsophagus, perforating it with a small hole, introducing into it a glass funnel, and pouring the liquid into the stomach: that being done, the œsophagus is to be tied below the opening. It would be imprudent to prefer to this method, the use of an elastic gum tube adapted to a syringe, for many animals bite the tube, pierce it with holes, and the fluid then flows out of the mouth; beside, syringes of tin might decompose certain poisonous fluids.

3rd. If the suspected substance, instead of being fluid, has a soft or solid form, and could not possibly be made to enter into the stomach by means of the funnel, we should begin by expressing it, in order to obtain the fluid part, which should be introduced in the manner we have described, and the solid portion should be put into a small paper cone, in order that it may be pushed down into the stomach, by an opening made in the œsophagus: the ligature of this canal should then be effected. This manner of operating presents immense advantages. In fact, it is the only method by which vomiting can be prevented; and how many poisonous substances are there not, of which the stomach would instantly unload itself after their ingestion, which, being thus retained, are capable of developing symptoms of poisoning, and even of producing death!

But, will it be said, the operation of the œsophagus constantly destroys life, and frequently enough produces alterations in the textures (*Vide* the Appendix); how then determine that death has been the result of the suspected substance, rather than of the operation? This objection has no foundation, for either the suspected substance is in quantity sufficient to destroy the animals, or it is not. In the first case, death will take place during the first forty-eight hours, and will be preceded by symptoms more or less severe, a

phenomenon never observed in the simple ligature of the œsophagus.*

If the substance should not be in sufficient abundance to produce death, the experiment will not be more conclusive, than if the œsophagus had not been tied. In fine, let us suppose a case the most unfavourable to our opinion, that in which this substance should produce variable symptoms, which should disappear at the end of two or three days : these symptoms, it may be said, would be attributed to the poison, if the œsophagus had not been tied, whilst, in the contrary case, one might be inclined to believe that they depended on the operation. To that we reply, that this operation of itself would not produce, during the first forty-eight hours, any other symptom than a slight dejection, and all other morbid phenomena that may be observed, ought to be attributed to the poisonous substance. Beside, would not the practitioner be to blame to decide on the existence of a poison, because the animal to whom he had given the suspected substance, had appeared incommoded for two or three days ? These sorts of experiments ought not to be esteemed valuable, except as they may furnish a well decided result ; that is to say, an acute disease followed by sudden death ; or when they furnish no decided symptom, and are moreover agreeable to the results obtained by chemical analysis when the poisonous substance belongs to the mineral kingdom. In doubtful cases, the practitioner ought always to endeavour to be favourable to the accused.

4th. If the suspected substance produced the death of

* There would only be the symptoms produced by the corrosive poisons, that might sometimes be confounded with the dejection produced by the operation of the œsophagus ; but the opening of the body would elucidate the matter ; for, in the case where the corrosive poison had produced death, within the first forty-eight hours, it would give rise to a very extensive inflammation of the membranes of the stomach (unless death should have happened very suddenly) ; a lesion, which cannot depend on the simple ligature of the œsophagus.

the animal, it will be necessary, before concluding on the existence of poison, to be well assured, that the person, in whose digestive canal it was found, has not died from one of those spontaneous affections which we have spoken of; for it might happen, in this case, that the animal fluids, and particularly the bile, had contracted deleterious qualities, capable of producing all the symptoms of poisoning.

5th. In the case where the animal should not experience any remarkable symptom from the substance, there will be no right to conclude, from this single experiment, that no poisoning has taken place. In fact, a multitude of causes might prevent the fluids contained in the digestive canal of a person, who had really died from the action of some poison, from being of a poisonous nature. 1st. The poisonous substance might have been decomposed in the stomach, by different kinds of food, or drinks, or by the animal texture. Thus, for instance, twelve grains of corrosive sublimate are swallowed by a man in good health; he experiences symptoms of poisoning, and dies; the body is opened four and twenty, six and thirty, or eight and forty hours after. A dog is made to swallow the contents of the digestive canal, and suffers no inconvenience from it. We have observed this phenomenon a great number of times. It would be extremely wrong to conclude, that the patient had not been poisoned. It is evident, that in this instance, the sublimate has been decomposed by the food, and even by the membranes of the stomach, converted into an insoluble matter, which exerts no hurtful action on the animal economy.

The same thing would happen, if verdigris had been taken before or after the ingestion of albumine, and of some other animal substances; the same may be said of muriate of tin, and of certain other poisons. 2nd. The poisonous substance may have been taken in a sufficiently strong dose, and rejected afterwards by vomiting, yet nevertheless produce death: the digestive canal, in this case, contains mucosities and bile,

which do not contain an atom of the poison ingested, and which, consequently, will produce no accident when given to dogs. 4th. It may happen, that the poisonous substance is of the number of those that are easily absorbed; that the patient has taken a dose sufficient to kill him; but that a very small quantity remains in the digestive canal; in that case, the negative result obtained by giving to dogs the contents of the digestive canal, would be more likely to mislead than to enlighten; so that we are of opinion, that experiments of this kind, separately considered, possess no value only as they present a positive result, that is to say, death; but, we repeat again, they ought not to be regarded, even when well made, but as a secondary means, proper for corroborating the conclusions drawn from chemical analysis, symptoms, and lesions of texture.

ARTICLE IV.

Of the means proper for distinguishing whether the Poison has been introduced into the Digestive Canal during Life, or after Death.

1076. Of all the crimes hitherto committed, there is none which inspires so much horror, as that which consists in introducing into the rectum of a dead body a poisonous substance of any kind, with the view of accusing an innocent person of having been the perpetrator of the poisoning, and so to compromise his honour and his life. Nothing can equal such an atrocity, and we were far from believing that it had ever been committed, until we were able to procure several proceedings of the Criminal Court of Stockholm, in which there is mention of a case of this kind. Medical jurisprudence embraces few cases of so high importance.

Let us suppose a person to be attacked all at once with a serious disease, which is spontaneous, who dies at the end of a

few hours, and into whose rectum is injected, a few moments after death, a corrosive solution. A report is circulated that he has been poisoned, and the magistrates order a practitioner to verify the fact. The latter proceeds to the opening of the body, recognises the existence of poison by chemical analysis; and discovers an inflammation more or less intense of the textures to which the poisonous substance has been applied. If he does not reflect that the poison possibly may have been introduced after death into the rectum, and is ignorant of the means of ascertaining this fact, he decides that the person has died from poison, and sacrifices an innocent victim to the vengeance of a vile assassin.

It has then appeared to us essential to undertake a labour to that effect, in order to be able to establish characters proper for distinguishing whether the poison has been introduced into the digestive canal before or after death. Our experiments have been made on the dead bodies of men and of dogs; we have multiplied and varied them; sometimes the poisonous substance has been introduced immediately after death, sometimes half an hour, an hour, two hours, or four and twenty hours after, in order to be able to establish the alteration which the textures undergo under these different circumstances. We have thought it useful to confine our experiments to corrosive substances; the narcotics and narcotico-acrids not producing any local lesion after death, or producing a very slight degree of it similar to the former.

EXPERIMENTS MADE WITH CORROSIVE SUBLIMATE.

Experiment 1st. A large shaggy dog was hung at three quarters past eight in the morning; five minutes after, a drachm of Corrosive Sublimate, in the form of powder and small fragments, was introduced into the rectum. The body was opened the next day at two in the afternoon. The great intestines

contained no excrementitious matter, but the rectum exhibited a remarkable alteration from the anus to about four fingers' breadth above; it was externally of a fine white colour; the serous coat was opaque, hard, and resembled, to a certain degree, an *aponeurosis*; the vessels of the *mesorectum* were slightly injected of a blackish red; the muscular coat was white as snow. There was found on the mucous coat corresponding to the injured portion, the greatest part of the Sublimate employed: this coat was wrinkled, as it were granulated, somewhat hardened, and exhibited several folds of a *clear rose colour*, imitating, by their arrangement, venous ramifications; these folds were separated from one another by portions of an alabaster white colour. On stretching this internal membrane on the hand, the wrinkles could be made to disappear, and it could be rendered smooth. Immediately above these four fingers' breadth, the intestines presented their natural colour, and the membranes were thin and soft to the touch, so that there was a line of demarcation perfectly well defined *between the parts to which the Sublimate had been applied, and those which had not been in contact with it*. The portions of the intestine attacked by the Sublimate were put into water, and twenty days after no sign of putrefaction had manifested itself. They were submitted to chemical analysis after being boiled a long time in water, and metallic mercury was extracted, a proof that the mercurial preparation had been decomposed, converted into muriate of mercury at minimum, which was intimately combined with the animal matter. (Vide Vol. i. Part i. § 73, p. 71.)

Experiment 2nd. At nine in the morning, forty-eight grains of Corrosive Sublimate, under the form of powder and fragments, were introduced into the rectum of a dog in good health. At the end of three minutes the animal uttered complaints, and passed some excrementitious matter tinged with blood. A quarter of an hour after, he uttered plaintive cries, and appeared agitated. The next day the experiment was

begun again, and the same dose of the poison was introduced ; the animal died ten hours after. The opening of the body took place the following day. The intestines were inflamed to the extent of *eighteen inches*, beginning at the anus. Far from exhibiting the white colour and thickness which we have described, the serous membrane was red, very much injected, and thin ; the Corrosive Sublimate was no longer found in the interior of the intestines (it had probably been evacuated by the stools) ; the mucous membrane appeared of a blackish gray colour, in the extent of two fingers' breadth, immediately above the anus ; nevertheless, on detaching it, and placing it between the eye and the light, it was seen to be of an exceedingly deep red colour. The portion situate immediately above, and which extended to the height of eight or nine inches, was also of a very intense red colour, and was detached easily by rubbing it : beyond this point the redness diminished in intensity, and was no longer perceptible at the height of twenty, or two and twenty inches ; but this diminution was effected in a gradual manner, and did not exhibit, as in the preceding experiment, *a line of demarcation well defined, between the sound and the diseased parts*. The muscular membrane was of a bright red colour, throughout the whole extent of the affected portions. It is easy to discover, that in this experiment, the organic lesion was not confined to the spot where the poison had been applied, but that it was extended much further.

Experiment 3rd. A great shaggy dog was hung at noon. Three quarters of an hour after, three ounces of a concentrated solution of Corrosive Sublimate were introduced into the rectum. The body was opened the next day at two in the afternoon. Almost all the great intestines had been in contact with the solution ; their texture was whitened and thickened ; the mucous membrane exhibited several zig-zag bands, finely clouded of a rose colour, which was contrasted with the white colour of the other portions. Immediately above the part with which the poison had been in contact, the intestine was

in its natural state, so that *there was a line of demarcation perfectly well defined*, a phenomenon which *never* exists when this substance has been introduced during life.

Experiment 4th. A small dog was hung at noon. An hour and a half after, a drachm of Corrosive Sublimate reduced to a fine powder, was introduced into the rectum. The opening of the body did not take place till four days after. The alteration extended only to three fingers' breadth above the anus; the muscular and serous coats were white like alabaster; the mucous membrane exhibited rose-coloured fringes, as in Experiment 1st, which were divided by portions covered with Corrosive Sublimate, and proto-muriate (sub-chloruret) of mercury of a grayish colour. There was also here *a line of demarcation exceedingly well defined*, between the portions on which the Sublimate had been applied, and those which had not been in contact with it.

Experiment 5th. A small dog was hung at noon. The next day at eleven o'clock, a drachm of Corrosive Sublimate, reduced to fine powder, was introduced into the rectum, and the body was opened the following day at noon, that is to say, twenty-five hours after the introduction of the poisonous substance. There was no sensible alteration, except in the space of four fingers' breadth above the anus; the muscular and serous coats were white as snow, thickened, and hardened; there was above the internal membrane a coat of a grayish colour, mixed with white points, and which consisted of the muriate of mercury at minimum (sub-chloruret of mercury), and Corrosive Sublimate: this grayish coat adhered so strongly to the mucous membrane that it was impossible to detach one without the other. This membrane, moreover, exhibited the same gray colour, and did not present *any zone of a rose-colour, nor of a clear red*.

Experiment 6th. The same experiment, repeated three times on human subjects, furnished similar results. There is no doubt, that if the injection had been administered a few

minutes after death, and even an hour after, whilst life was not yet destroyed in the small blood-vessels of the rectum, we should have produced reddish zones, which, under these circumstances, have constantly made their appearance in the dead bodies of dogs. We have never thought of making these experiments on human bodies, because we are convinced that there might be danger, if, by accident, the patient should not be yet dead.

EXPERIMENTS MADE WITH THE ARSENIOS ACID (ARSENIC OF COMMERCE).

A small robust dog was hung at ten in the morning. Five minutes after, a drachm of Arsenious Acid, in the form of powder and small fragments, was introduced into the rectum. The body was opened the next day at noon. There was a very distinct alteration for the space of four fingers' breadth, immediately above the anus; that is to say, in all the parts to which the poison had been applied; the mucous membrane was of a tolerably bright red colour; the portion corresponding to that place where the serous coat is reflected upon the bladder, exhibited a spot of a blackish red colour as broad as a shilling, formed by extravasated blood; all the other injured parts were covered with Arsenious Acid; the other coats appeared in their natural state, and it was impossible to discover the least alteration in the parts of the intestine situate immediately above that to which the poisonous substance had been applied; so that *there was a line of demarcation extremely well defined.*

Experiment 2nd. At nine in the morning, forty-eight grains of Arsenious Acid, in the form of powder and fragments, were introduced into the rectum of a dog in good health; six minutes after, the animal passed a solid stool, not very copious, in which were found almost all the fragments of the poison. Two days after, the experiment was repeated,

with this difference, that the Arsenious Acid was perfectly pulverized. The animal lost his appetite, fell into a state of dejection, and died ten days after the first experiment. The parts round the anus were excoriated, the integuments detached, in such a manner that there was an ulcer of some extent. The mucous membrane of the intestine exhibited, for two fingers' breadth immediately above the anus, a greenish gray colour internally. The surface next the muscular coat was red. Above this portion, the mucous membrane was of a bright red for the space of six or seven inches, and the redness diminished in proportion as it approached the small intestines; so that there was not, as in the preceding experiment, *a well defined line of demarcation*. The muscular and serous coats of the rectum presented a red colour in the parts near the anus.

Experiment 3rd. A dog of middle size was hung at noon. The next day, at one in the afternoon, a drachm of Arsenious Acid reduced to a fine powder was introduced into the rectum, and the body was opened the following day, twenty-five hours after the introduction of the poisonous substance. The mucous membrane, within the space of two fingers' breadth above the anus, presented two red spots as large as a shilling, upon which was lying the Arsenious Acid. The other coats were in their natural state; the rest of the digestive canal exhibited no alteration, in such a manner that there was a line of demarcation exceedingly well defined, between the parts affected, and those to which the poison had been applied.

Experiment 4th. This experiment repeated three times on human subjects, presented similar results.

EXPERIMENTS MADE WITH VERDIGRIS.

Experiment 1st. A small dog was hung at noon; immediately after, about a drachm of Verdigris in powder was in-

introduced into the rectum, and the body was opened forty-eight hours after. The intestinal canal presented its ordinary appearance, except in the last two fingers' breadth of it immediately above the anus; the interior of this portion of the rectum contained all the poison employed; the coats which composed it were somewhat thickened, and of a greenish blue colour, in such a manner, that the Verdigris appeared to be intimately combined with the membranes. *There was no trace of inflammation or ulceration.*

Experiment 2nd. At nine in the morning, forty-eight grains of Verdigris in powder were introduced into the rectum of a dog in good health; two days afterwards, twenty-eight grains more were given him. The animal fell into a state of dejection, and expired at the end of the eighth day.

Opening of the body. The stomach presented near the pylorus, two blackish spots formed by extravasated blood, in the chorion of the mucous membrane; the inferior half of the colon, and the beginning of the rectum, exhibited several red patches of the size of small peas; the remainder of the digestive canal was sound, excepting the end of the rectum; a little above the anus were seen two ulcers as large as a sixpence, with edges thick and elevated, separated from one another by a multitude of other small ulcers. Those parts of this portion of the intestine that were not ulcerated, were variegated with spots of a deep bluish green colour, and with others of a red colour.

Experiment 3rd. A shaggy dog was hung at twelve o'clock; an hour and a half after, a drachm of powdered Verdigris was introduced into the rectum: the body was opened the next day at two o'clock. There was only the inferior part of the rectum, where the Verdigris had been applied, in which the coats were tinged with a greenish blue colour by the poison; not the least trace of redness was discovered: the rest was in its natural state.

Experiment 4th. Some Verdigris was introduced into the

rectum of two human subjects four and twenty hours after death; the bodies were opened thirty-six hours after, and the same phenomena were observed as in the preceding experiments.

EXPERIMENTS MADE WITH SULPHURIC ACID.

Experiment 1st. A small dog was hung at twelve o'clock; five minutes after, about six drachms of Sulphuric Acid, concentrated to 66° , were injected into the rectum. The opening of the body took place the next day at two o'clock. The exterior surface of the great intestines, from the anus to twelve fingers' breadth above, was thickened, of a white colour, and scattered over with a multitude of injected vessels, which were black and hard, as if the blood had been decomposed by the Sulphuric Acid. The mucous membrane corresponding to the whole of this portion, was of a yellowish colour, and was easily detached in the form of flakes, when slightly rubbed with the scalpel; the muscular coat was white; there was not the least *trace of redness*; the Sulphuric Acid had not blackened and turned to charcoal the textures with which it had been brought in immediate contact. There was seen near the anus some excrementitious matter, which had been attacked by the acid. The portion of the intestines, situate above the altered part, was sound, and in its natural state.

Experiment 2nd. The same quantity of concentrated Sulphuric Acid was injected into the rectum of a great dog, which was in good health: he very soon experienced cruel pains, and died during the night.

Opening of the body. The rectum and the inferior half of the colon were so much thinned by the destruction of their mucous and muscular coats, that at the least touch they rent, and could only be separated by fragments; these pieces, which were of a gray ash-colour, were sprinkled over on their exter-

nal surface with a multitude of small vessels injected of a black colour, and hardened; on their internal surface was found some excrementitious matter, which had undergone alteration, and which could be easily removed. A thick coat was then found of a grayish brown colour, the remains of the mucous and muscular coat, which had been gangrened; this coat might be separated by means of a knife. The superior half of the colon presented on its interior surface a yellow flaky coat, produced probably by the yellow matter of the bile which had been set at liberty by the Sulphuric Acid: the muscular coat corresponding to this portion, appeared gray on its mucous surface, and of a deep red on the serous surface: it was likewise scattered over with vessels injected with black; lastly, the serous coat was of an ash colour; the cœcum and ileum presented an alteration similar, but less intense; the other portions of the digestive canal were sound.

Experiment 3rd. A large shaggy dog was hung; four and twenty hours after, about six drachms of concentrated Sulphuric Acid were introduced into the rectum, which acted principally upon the excrementitious matter, which happened to be contained there in great abundance; hence this was of a black colour, whilst the texture was only slightly grayish.

EXPERIMENTS MADE WITH NITRIC ACID.

Experiment 1st. At twelve o'clock, five drachms of Nitric Acid of commerce (aqua fortis) were introduced into the rectum of a dog in good health: immediately after, the animal was agitated, his belly swelled, and he suffered considerably. He died eight hours after. The opening of the body took place the next morning: the inferior half of the rectum exhibited internally several red points upon a yellow ground; the muscular coat was of a crimson colour, and the serous coat of a very fine yellow. The superior half of this intestine was of a deep red, and exhibited some ulcerated points: the portion

of the colon situate immediately above the rectum was in its natural state for the extent of about three inches; the rest of the intestinal canal up to the pylorus, was of a deep red colour internally, and several blackish patches were seen in it, formed by black extravasated blood.

Experiment 2nd. A small dog was hung at noon: six minutes after, five drachms of Nitric Acid of commerce were introduced into the rectum; and the body was opened the next day at eleven o'clock. The rectum, and about the fourth part of the colon, exhibited the appearance of a solid tube, of a beautiful clouded yellow colour, except near the anus, where it was white. On dividing it, it was seen that the mucous membrane corresponding to this portion had been destroyed, and converted into flakes of a canary yellow, which might be detached with the greatest facility; the two other coats were yellow, except in the part nearest to the anus; immediately above this tube, the colon, less altered, exhibited internally, for the space of about two inches, a kind of hollow cylinder of a yellowish colour, formed by the mucous membrane, and thick enough to allow of its being detached and removed whole and entire. The portion of this intestine nearest the cœcum was also somewhat yellow: in other respects, there was not the least trace of redness or inflammation in the digestive canal.

Experiment 3rd. *M. Tartra* introduced two ounces of Nitric Acid of commerce into an empty stomach, isolated from the body, and connected with the œsophagus and duodenum: he let it remain for two hours, and he perceived that a considerable quantity of gas was disengaged. The great extremity and the long curvature of the stomach presented at the same moment some very broad spots, which at first appeared white on the external surface of this organ, shortly after became yellow, and extended at the end of a few hours, so that the coats of the stomach appeared greasy, and yellowish on the inside as on the outside. In another experiment, the

acid remained four days in the stomach, and the alteration was carried to a great extent. This viscus fell into pieces on the least handling; it might have been easily reduced to a sort of greasy paste under the fingers, of a very fine yellow colour.

Experiment 4th. These experiments presented similar results when the acid was introduced into the stomach while still forming an integral part of the body; nevertheless, all the parts in the vicinity of the stomach were secondarily affected when the acid was in sufficient quantity, or when it remained a sufficiently long time in this viscus.

Experiment 5th. Before introducing the Nitric Acid, *M. Tartra* injected into the stomach different fluids, such as water, wine, brandy, milk, broth; under these circumstances, the action of the caustic being weakened, it was much less intense; sometimes the mucous membrane appeared very little affected; more frequently, it had a yellowish tinge, appeared to be slightly thickened, unctuous under the fingers, and separated easily from the exterior membranes. It is evident, that the alteration of the textures ought also to be less when the stomach contains solid food on which the Nitric Acid might exert its action.

1077. It results from the facts just described:

1st. That the corrosive sublimate, arsenious acid, verdigris, and the sulphuric and nitric acids, when introduced into the rectum a few minutes after the death of animals, give rise to alterations of texture which imitate to a certain degree, those produced by the ingestion of these same substances during life.

2nd. That it is nevertheless easy constantly to distinguish them by the following character: A. In case the poison has been introduced after death, it is found in tolerably large quantity at a very small distance from the anus, at least if it has not been employed in the form of solution; whilst, if introduced during life, it is in small quantity, owing to the greater part of it having been expelled by the stools which

it produces. B. The alteration of texture never extends beyond a small distance from the part to which the poison has been applied after death, in such manner that there is *a line of demarcation exceedingly well defined* between the affected parts and those which are not at all so; a phenomenon, which, in the other case, never happens. In fact, these poisons act on the living subject by producing a strong irritation; to which succeeds an inflammation, of a variable degree of intensity, but which always extends far beyond the place where they have been applied, and which decreases insensibly, in proportion to the distance from the point most inflamed, so that there never is *a line of demarcation perfectly marked out*. C. The redness, inflammation, ulceration, and other lesions, are carried to a length infinitely greater when the poison has been introduced during life, than when it has been applied after death; so likewise, if on examination of the body, the rectum or stomach be found covered with a tolerably large quantity of one of these poisons, and the lesion not very decided there will be very strong reasons to believe, that it has been applied after death.

3rd. That amongst these poisons there are some that produce lesions so characteristic when applied after death, that it is impossible to mistake them; such are the corrosive sublimate and nitric acid.

4th. That when they are introduced into the digestive canal, four and twenty hours after the decease of the person, they no longer excite either redness or inflammation, because life is entirely destroyed in the capillary vessels; and consequently there is no longer a possibility of confounding these cases with the poisoning, which takes place during life.

5th. Lastly, they are capable moreover of producing inflammatory phenomena, when applied an hour or two hours after death; but that it is sufficient, in order to form a correct judgment, to attend to the considerations we have just established.

We purposely omit noticing the experiments of Savary, relative to the application of caustics to the skin during life, and after death ; the results of those labours not appearing to us to apply directly to the subject we are treating.

ARTICLE V.

Of the Poisoning of a Number of Persons at once.

1078. The instances of several persons being poisoned at the same time, are by no means rare ; and they appear, at first sight, to present no interest to the juridical physician. In fact, if at an entertainment, where there are a number of guests, a poisoned dish should be served up, whether by mistake or malice, and a short time after, all of them experience similar symptoms, sufficient to substantiate the poisoning, the practitioner ought to act according to the principles which we have hitherto laid down. But the case is not the same should only a few of the guests be attacked, whilst the rest experience no inconvenience ; or if some experience only slight symptoms, whilst others die, or become a prey to alarming symptoms, &c. It is evident, that this disparity of effects, where there appears to be only one cause, must render this case of medical jurisprudence more complicated ; since it is required to render an account of a multitude of apparent contradictions which present themselves. Before laying down the precepts which ought to direct the practitioner in this thorny track, we shall report an observation of the celebrated *Morgagni*, calculated to throw a light on this subject.

“ In the month of May, 1711, four persons, that is to say, a priest, two women, one of which was his sister in law, and another person, all in good health, and on a journey, stopped at an inn to dine. Setting out on their road after dinner, the priest in a short time felt himself so ill in the bowels, that he was obliged to dismount from his horse. Notwithstanding the copious evacuations, both upwards and downwards, the pains

increased every moment, and it was necessary to take the patient back to Césenne, the place where they had dined, and where the priest arrived half dead. A medical man who was called in, thinking he had only to deal with an ordinary colic, employed a number of fomentations, glysters, purgative draughts, anodynes, &c. Although he saw that one of the women had also strong evacuations with pains and faintings, and that the other person complained of pains, and of a weight at the stomach, he never suspected the presence of a poison, because the other woman had no complaint, and the landlord protested with many imprecations, that there was nothing dangerous in his dishes; however, the evacuations saved the patients, and as they diminished a little the next morning, it allowed of their removing into the neighbourhood of Morgagni's residence, whom they immediately called in. This great physician having ascertained whether there was any dish at the table of which the woman who was in good health had not eaten, and having found that it was a great dish of rice which had been first served up, concluded from this circumstance that it was this dish that contained the poison. The difficulty however was, that the priest, who had eaten the least, and who had been on the whole extremely abstemious, was precisely the person who had suffered the most, and the soonest; that the woman, who had eaten more than the priest, had been less sick than he; and that the other person, who had eaten more than all the rest, was the one who was the least incommoded. Was there no cheese rasped over this rice? demanded Morgagni. They answered in the affirmative; the priest, who had little or no appetite, ate scarcely any thing but the cheese. In that case, said Morgagni, you understand already that there was arsenic among that cheese, which had probably been prepared for killing rats; and not having been laid away with sufficient care, some one had taken it to serve up with your rice during the time that you were hurrying the landlord to send up your dinner. These conjectures were

verified by the confession of the landlord himself, who, having learned that the patients were out of danger, was no longer afraid to acknowledge that such had been the cause of this unfortunate accident. *Morgagni* was only astonished that they had not found any ill taste in the cheese; he succeeded however in restoring fortunately these three patients, by the use of milk, whey, and oil of sweet almonds; but the priest was afterwards affected with different symptoms, which it is not necessary to relate here.”*

1079. The practitioner will not be able to form a correct judgment in cases of this kind, if he neglect to pay attention, 1st, to the state of the stomach of the different persons poisoned: in fact, those who have taken a great quantity of food or drink, would feel in general less severe symptoms than others; 2nd, to the nature of the dishes and of the drinks, as well as to the quantity that each person may have eaten or drank; 3rd, to the existence or absence of vomitings and stools. It is evident that it may happen, that some persons have eaten a tolerably large quantity of a poisoned dish, without any serious symptoms taking place, for this very reason, that the quantity of the food was considerable, and that it produced easily copious evacuations, by means of which the poison had been expelled.

ARTICLE VI.

Of Poisoning, the result of Suicide or Homicide.

1080. It may be easily conceived that chemical analysis, and the inductions drawn from the symptoms and lesions of texture, are insufficient to resolve this difficult question: we can only then endeavour to throw light on it by the assistance of moral considerations. “We should attentively examine,” says the Professor *Fodéré*,

* *FODERE*, op. citat. tom. iv. p. 242.

“ 1st. Whether the subject had been affected for some time past with a melancholy delirium ; whether he has sustained any losses ; whether his hopes have been disappointed ; whether he has experienced any poignant grief.

“ 2nd. Whether any of the persons with whom he lived, or with whom he associated, or with whom he had any kind of connexion, had any interest in his death.

“ 3rd. The season of the year should also be taken into consideration ; for I have observed, and without being sufficiently able to assign any reason for it, that suicides were more frequent during the periods of the solstices and the equinoxes.

“ 4th. Whether the patient, instead of making complaints, remains quiet, seeks solitude, and refuses the aid of medical men and of medicines.

“ 5th. Any kind of writing, which persons commonly execute previously to committing the act of suicide, in order to express their last sentiments, or their last wishes, is one of the most certain proofs, that they alone are guilty of their own destruction. As for the remains of the poison found in their pockets or in the room, they are a very equivocal sort of guide, and which may belong as much to homicide as suicide.

CHAPTER II.

ARTICLE I.

Of Slow Poisoning.

1081. IT sometimes happens, that persons swallow, for several days in succession, a small quantity of poison, not capable of producing a speedy death, but which occasions symptoms more or less grievous, which may, in the end, have the most fatal consequences: the combination of accidents arising from a cause of this kind, constitutes *slow poisoning*, which must not be confounded with *consecutive poisoning*. In fact, this latter is occasioned by the ingestion at once only of a certain quantity of poison, which produces at first all the symptoms of acute poisoning, to which the patient opposes resistance; but which are followed by a multitude of consecutive phenomena, the duration of which varies considerably.

We do not admit, that any *slow poisons* are known, by means of which death can be procured at any determinate epoch. This assertion, engendered by ignorance, and kept up by absurd prejudices, is altogether contrary to the laws of organic nature. How in fact can we determine *a priori*, the resistance that the vital powers will oppose to the cause tending to destroy them, a circumstance, without which it is not possible to fix the epoch at which the symptoms will take place, and when they will be followed by death? Might we not here seize the opportunity to combat with success, one of the most generally received opinions amongst a very great number of

medical men, and which is nearly allied to the present question, that is, that in many kinds of diseases, there are determinate and constant days, when the patient is much more severely affected? It will be sufficient to reflect on the great diversity of causes which are capable of developing these diseases, on their variable intensity, the different degree of reaction, &c., to be convinced, that of two persons having the same affection, the one might present severe symptoms on the same day, as the other would be in a situation much more satisfactory.

The following facts may serve to throw a light on the history of *slow poisoning*.

OBSERVATIONS.

1st. A sailor, twenty-six years of age, of a tolerably good constitution, but debilitated by long and frequent sea-voyages, was admitted into the Hospital of Land . . . the 5th Fructidor, year 7, for a syphilitic disease, with which he had been infected, for the first time, for three months. The first symptom of the disease had been a gonorrhœa, which an injection of brandy, diluted with water, thrown up the urethra, had suppressed in the course of eight or ten days. As no fresh symptoms succeeded to those which disappeared, the patient believed himself perfectly cured, and a few days after, departed with the ship, on board which he was embarked. He informed me, that on the very day he set sail, he felt pains in the groins, at first not very severe; that these pains increased every day in intensity, and he perceived a small tumor on each side; having no doubt that they were buboes, (these were his expressions,) he consulted the surgeon of the ship, who applied to each groin, a linseed-meal poultice: beside which he desired him to come every day, to take a glass of some drink, which left a very disagreeable taste in the mouth. I have since learned, that it was a solution of oxygenated muriate of mercury.

The buboes continuing to grow larger for several days, softened at length in their most prominent part, and an incision made in each of them, gave discharge to a very small quantity of thick bloody pus. The patient still continued the use of his pretended drink, paying very little attention to regimen, although expressly forbidden to drink any spirits or wine, and his rations of both being in consequence stopped.

The buboes were dressed with a pledgit covered with a mixture of cerate and mercurial ointment, and, above all, a poultice of linseed meal.

Being clear from the severe pains which he had felt for several days, this man resumed his laborious occupations; from that moment, it was necessary to restore him his rations of wine and spirits, which they had no longer the right to refuse: he followed altogether the diet of sailors; neglecting the dressing of his buboes, and seldom tasting the drink prescribed for him, he almost forgot his complaint altogether. The cruize was protracted, many circumstances contributed to render it disagreeable and fatiguing. This man, tormented by his situation, forced to undergo excessive fatigues, wanting good nourishment and change of linen, having almost constantly wet clothes on the body, and obliged to pass from a climate hot and moist, to one continually cooled by winds more or less violent; this man, I say, soon began to feel the attacks of a disease so fatal to mariners, and from which so little care is taken to preserve them: I mean the scurvy.

A sense of weakness, pains in the limbs, lassitude, languors, inaptitude to labour, disgust for his ordinary occupations, swelling of the legs, frequent hæmorrhages from the gums, a bad state of the mouth, the difficulty of eating biscuit increasing; all these symptoms combined, announced to him a disease which he had learned to distinguish, having been several times attacked with it.

This was rendering the first disease complicated: he thought it was best to defer the treatment of both of them to a more

propitious season. He consequently finished the cruize in this deplorable state.

The ship in which he was embarked, came into Brest; a few days after he was sent to the Hospital of Land. . . It was there that I had first occasion to see him.

He told me that he had never been sick before his first cruize, which lasted five months, three of which were passed at sea, and two at Cape François. The ship, on board which he was embarked having gone into Rochefort, he was sent to the hospital for treatment at the beginning of his scurvy. He was there attacked with the endemic disease of that country, which he had for four months. He left Rochefort in a state of convalescence, and passed to the Port of Brest, to which he belonged: he made several voyages, from which he returned in tolerable health, except a little touch of scurvy, which yielded to a few days' treatment on shore.

This is, as far as I have been able to collect it, a picture of his situation when submitted to my observation.

This man, who was tall and of a brown complexion, seemed to exhibit the remains of a good constitution, but one which many causes had contributed to deteriorate: his countenance was pale, saturnine; the eyes dull, sunk in their sockets; the cheek-bones prominent; the skin of the face drawn up; the lips thick, of a pale red colour; the gums detached, blackish, from which oozed a bloody fluid: the degree of emaciation was extreme; the legs were slightly swelled. The patient had in the right groin, an ulcerated tumor, from which flowed a very small quantity of purulent matter. The bubo of the left side was cicatrized; but there still remained a very considerable fulness of the glands of that side. The patient felt pains in the limbs.

This man at first was put on an antiscorbutic treatment, a vegetable diet, frequent exposures to the sun, a pure air, which, with the use of antiscorbutic medicines, soon brought about a change in his condition very decided. In the course

of six weeks of this treatment he had recovered a certain degree of flesh, the swelling of the legs had absolutely disappeared, the mouth was in a better condition, the skin resumed its natural colour, the pains decreased; his strength increased daily, and every thing seemed to announce a speedy convalescence; but the buboes remaining still in the same state, the surgeon to whose care he was committed, thought it necessary to submit him to an antivenereal treatment: there was consequently administered to him a solution of the oxygenated muriate of mercury, in the dose of a spoonful of the liquor of Van Swieten in a glass of milk, twice a day: to this was added some sudorific drink.

This man took ninety or a hundred spoonfuls of the solution without any decided effect resulting from it, unless it was some degree of emaciation. The bubo on the right side continued to suppurate, and the swelling on both sides was very considerable; the surgeon thought it proper to persist in the use of the oxygenated muriate of mercury; but from that time its effects began to shew themselves in a terrible manner. The patient experienced at first slight colics, but they became in a short time violent and continued. The digestion becoming extremely painful, it was necessary to reduce him, for the whole of his diet, to a little rice-cream. He was constantly tormented by nausea, and putrid eructations. Singultus always followed the introduction into the stomach of any kind of solid food. In a short time he was only able to lie upon the back; a degree of fever took place, with slight exacerbation towards evening, followed by copious sweats about the breast and head; the bubo of the right side became painful; the suppuration, which was copious and fetid, acquired such a degree of causticity, that by corroding all the surfaces with which it came in contact, it produced a great number of small ulcers, which increasing daily, united at length and formed one single one of prodigious extent, which occupied the whole of the groin and abdomen on the right side.

The use of oxygenated muriate of mercury was at length discontinued, at the request of the patient, at the hundred and fiftieth spoonful of the solution; but it was too late: the poison had exerted a fatal action upon the organs; the state of the patient grew every day worse, the emaciation became extreme, and this unfortunate man, who was given up to the most excruciating pains, after lingering out a miserable existence, expired on the 21st Nivose, the hundred and thirty-sixth day after being admitted into the hospital. The excessive fetor of the dead body prevented us from opening it.*

2nd. We have reported, Vol. i. Part i. p. 149, an Observation, in which small doses of the Arsenious Acid were administered at several different times.

3rd. "At thirty years of age, being born with a sanguineous and bilious temperament, and having been married a year before, I was enjoying vigorous health, notwithstanding the excesses of my youth, when I was called to Paris to fill an important post.

"During a year, for which time my functions lasted, I was overwhelmed with bitterness and sorrow, and in the end my health was sensibly altered.

"On returning home, I thought myself labouring under a disease of the liver; every morning my tongue was very dry, and even chapped; my sleep was painful, and when, immediately after rising, I took a glass of water, I experienced sometimes eructations full of bile. I thought that a vomit was necessary, and prepared myself for it by drinking whey, and diluting drinks, with low diet.

"Four grains of emetic tartar produced no effect: the same thing happened from six grains, which I sent for immediately, desiring the apothecary to be asked whether he were certain of its being good. I afterwards added four grains more; and these fourteen grains, taken in twelve small glasses of water,

* LAVORT. Dissertation already quoted, p. 38.

(less than two bottles) and in less than two hours time, produced only a weak vomiting, with a slight tinge of bile.

“ In the afternoon, I passed about three stools of pure bile, and during one of them, I experienced a tolerably severe griping in the left hypochondrium ; a slight tenesmus came on, with oozing from the anus.

“ In the evening I ate a fish *au bleu*, I slept with a profound and tranquil sleep ; and the next morning on waking, my tongue and mouth were in so good a state, that I kept myself on low diet all the day, with the intention of taking, on the morrow, a fresh dose of emetic tartar to procure a complete vomiting.

“ In fact, the next day, I took eight grains of emetic tartar in six small glasses of water, that is to say, in less than a bottle, in the course of one hour, and this emetic produced no effect. I then persuaded my wife to procure me twenty grains, in order to double the dose of the evening before, but she was alarmed at my project, and prevented me from taking any more emetic tartar. I took the method of drinking, one after another, six great cups of warm water, and nevertheless I was not able to vomit. Lastly, by means of my fingers passed down my throat, I succeeded in throwing up a very small quantity of the water I had taken.

“ I then gave up the idea of making myself vomit ; for the water that I had taken flowed off by urine, and I passed towards night two or three stools of pure bile : I ate with pleasure and appetite a fish *au bleu*, before going to bed : I slept soundly and peaceably the whole night, and the next day my mouth and tongue, instead of being dry and chapped, were cool, and in a good condition.

“ Nevertheless, that same day my tenesmus increased, and when I was at the close-stool, I perceived that the evacuations were covered with a glairy matter, and scattered over with bile in a grumous state, some pieces of which, unmixed with other matter, were of the size of a lentil.

“ My stool being entirely finished, I passed without pain and without the slightest mixture, the quantity of a small plate full of matter absolutely similar to melted tallow which begins to grow solid, and a similar circumstance occurred every time I went to stool for eight or ten days.

“ Notwithstanding the violent exercise I was in the habit of taking, I was very fat; but at the end of eight or ten days, I was fallen into a state of excessive leanness; the skin of my belly seemed glued upon my loins, and my tenesmus, the only thing I suffered, gave place to a continual flow, and allowed me only with the greatest difficulty to walk, or remain erect.

“ A physician recommended to me aperients; I made use of them for several months, and my health was no better.

“ I had no looseness, but the stools were no longer so good as before: they were always more or less covered with a glairy matter; and the tenesmus, as well as the flow of whitish matter from the anus, increased instead of diminishing, &c.”*

4th. We have reported (Vol. i. Part ii. p. 469.) a case of poisoning by lead, which may very well enter into this article.

1082. We have tried several experiments on dogs, with the intention of determining the action of small doses of poison frequently repeated; but it may easily be conceived how painful, fastidious, and difficult a task it is: so likewise have we not been able to obtain results so satisfactory as we should desire. We have however observed, that the disease produced by the poison in small doses, presented a very strong resemblance to that which results from the ingestion of a greater quantity; the same may be said of the lesions of texture.

Should then the juridical physician be called in to decide on so difficult a case, he must keep in mind a great number of

* *Mémoire de M. Magendie sur l'Emetique*, p. 28.

physical and moral circumstances that may throw light upon it. Thus, for instance, he should examine whether the disease, which is the subject of his researches, does not depend rather on the bad constitution of the patient than on the slow action of a poisonous substance ; whether it does not belong to some hereditary or other organic affection : he should pay attention to the prevailing diseases, epidemic or endemic ; to any inconsiderate habit of taking medicines, and especially purgatives ; to the abuse of bleeding ; to violent exercise, or any other error in the patient's way of living ; to the violence of the passions ; to the valetudinary, hypochondriacal, and melancholy state of certain persons, &c.

ARTICLE II.

Of Accidents consecutive to Acute Poisoning.

1083. It often happens, that persons who have been poisoned by any energetic poisonous substance, experience the most grievous symptoms, which are not however succeeded by a sudden death. The state of these patients improves for a few days ; but in a short time severe symptoms take place, which may be more or less prolonged, and which generally terminate fatally. We shall relate some observations on this subject.

OBSERVATIONS.

1st. *Marie Ladan*, fifty-three years of age, drank about a spoonful of *aqua fortis*, thinking it to be common water. She very quickly threw up by vomiting the greatest part of it. Immediately after, came on hiccup, copious eructations, nauseas, repeated vomitings. Half an hour after, she was bled in the arm, and mucilage of gum arabic was given her, and milk. The first symptoms subsided by degrees ; but an excessively obstinate constipation, with which she was tormented

from the beginning, continued unaltered. At the end of ten days of treatment, and evident decrease of the symptoms, this patient ate, for the first time, a little vermicelli, and immediately vomited it. Since her accident, she passed a great quantity of saliva, and her breath was incredibly fetid; but in the matter that she vomited there was no membranous portion; only at the bottom of her throat she thought she felt the presence of some foreign body, which incessantly fatigued her, annoyed the deglutition and breathing, altered her speech, &c. On the twentieth day from her poisoning, after having made many efforts, she passed by the anus, a long membranous substance in one single piece, folded and rolled up, which represented the form of the œsophagus and stomach, with all their dimensions, and which was nothing less than the interior membrane of these organs, which had been raised and separated in all its points at once; it was one or two lines in thickness, and of a very distinct brown colour. The portions corresponding to the great and small extremities of the stomach were worn thin, and perforated with several holes. From that moment, the sensibility of the digestive canal became excessive, the vomitings were more frequent, and it was impossible to make her retain any food on the stomach. Milk, which had been her support for fifteen days, was now vomited in the state of curds. A few days after, the patient felt herself better, and ate some soup, eggs, and some small biscuits, and only vomited now and then. Her bulk was singularly decreased, but she preserved a great degree of freshness in her countenance, and was able to walk about a little: darting pains at the stomach, a most obstinate constipation, and a sort of continual uneasiness, incessantly opposed her recovery. These symptoms increased; the excessively copious salivation, which tormented her ever since the accident, was every day greater; all she took was thrown up; the intellectual faculties were in their natural state; the membrane of the lips and the

inside of the mouth, though sound in appearance, was removed by the slightest touch; the patient exhausted herself by fruitless efforts to vomit. At length, two months after the accident, she experienced a sudden shock, and died.

Dissection of the body. The cardiac and pyloric orifices were sensibly contracted; the interior surface of the œsophagus and stomach were very smooth and polished, spotted and clouded with a red colour more or less bright, and had none of its ordinary appearance; this last organ was singularly diminished in bulk. The intestinal canal did not appear to be much contracted, and all the abdominal viscera were found nearly in their natural state.

M. Tartra, from whom we have borrowed this observation; asserts that, in cases of this kind, the symptoms produced at first by the nitric acid decrease insensibly; but that the patients preserve a great disposition to vomiting. At the end of a certain time, the internal membrane of the digestive canal is struck with death, and thrown up, either entire or in small portions as it were putrid and puffed up. When death happens at a late period, the patients fall into a *marasmus*, because the digestion can no longer be carried on; they are tormented by a pressing desire to go to the close stool, without being able to evacuate; and sometimes three months elapse without their being able to pass any thing more than a few very small masses of excrementitious matter, moulded into the shape of pills of a few grains, at one or two different times; the emaciation becomes excessive, the countenance disgusting; they spit every moment, vomit incessantly sloughs or putrefied portions of the membranes, of an infectious smell, resulting from the exfoliation of the œsophagus and stomach, the shape of which they sometimes preserve. In some instances, these substances are brought away by stool. "The skin becomes dry, scaly, almost dead, and inert as in old age. The physical faculties are extinguished; the moral faculties are some-

times degenerated in a singular manner: there remains, if such an expression is allowable, nothing but the image. Those ravages, which according to the natural order of things, ought to be the progressive result of many years, are the effects only of a few months; every thing in these subjects presents the appearance of an accidental and premature decrepitude. The patient still exists, but he is only separated by an interval, which may be called almost imperceptible, from death, which is every day anticipating, and appropriating to himself by piece-meal, a portion of the domain of life.*

After the death of these persons, the digestive canal is found reduced to an extreme degree of smallness: it might be contained in the hollow of the hand. The intestines are of the same diameter as the little finger; sometimes they scarcely equal the size of a large goose-quill. Their coats are extremely thick; their cavity null, or almost null, and contains only a small quantity of mucosity. In some cases, the stomach adheres to the diaphragm, liver, or spleen. Sometimes these adhesions are simple, but most commonly, the coats of this viscus are disorganized and exfoliated; in that case, the organ, which is found to be in contact with the stomach, and which adheres to it in this part, which is completely burned, serves it for a covering, or rather, it is its external membrane which adheres to this *lacuna*, or sort of hole; it becomes thickened a little, but nevertheless remains sufficiently transparent for the colour of the texture of the viscus, which it covers, to be perceived. The orifice of the pylorus is so drawn up, that it is sometimes impossible to introduce a probe. There are perceived on the internal surface of the stomach, in its greater extremity, near the pylorus and the cardiac orifice, in the œsophagus, fauces, and pharynx, some smooth patches of a vermillion colour, or cicatrices, produced by the regeneration of the mucous membrane.

* TARTRA. Op. citat. page 169.

2nd. *Adam Péteur*, forty-six years of age, was employed for twenty-eight years, in coating porcelain with white lead. He experienced the first metallic colic in 1795: he was treated for, and cured of it at the *Charité*. Five months after, he had another; and from that time he was attacked with it every year. In 1802, he experienced pains, which increased gradually. He had remarked, for six weeks past, that his arms were become more weighty and feeble; it was likewise from this moment that the colics had decreased considerably. This phenomenon happened in the course of twenty-four hours; the patient's own expression was, that *the colic had fallen into his arms*. He entered the *Charité*, the 17th Ventose, year xi, (1803), and was in the following condition.

Appearance of old age, remarkable slowness in his answers, slight head-ache, temporary shiverings, no vomiting. He felt very little griping, the belly was somewhat depressed, he had no constipation; the pulse was rather rare than frequent, the arms were still a little moveable; the *extensores* muscles of the hands were paralyzed, as well as those of the fingers. His sleep was tolerably good; he walked about some time during the day.

On the 18th, he had an attack of epilepsy (it had already happened before since his admission to the hospital); he lost his senses, experienced convulsions, and foamed a little; the tongue was yellowish, somewhat dry, and not at all bitter. (*Sudorific ptisan, purgative glyster of painters, and anodyne; theriaca.*)

The 19th, no attack; in the same state. (*Cassia water with the seeds and two ounces of glauber salts, sudorific ptisan, anodyne glyster, julap.*)

The 20th. Pains in the arms and legs.

Up to the 13th Germinal, this patient had remained in a state of health that was fluctuating, being in general pretty

well for one in his situation, but finding himself better on some days than on others. His power of moving returned slowly; the gripings were dull and slight. His treatment consisted during all this time in sudorific ptisans, sometimes rendered laxative, anodyne glysters, antispasmodic draughts, extract of juniper, theriaca, &c. He was also purged several times. On the 27th, he had an epileptic fit.

The 14th Germinal, stupor, convulsive movements in the face, cough without expectoration; pulse feeble, small, and frequent; the night uneasy; slight wanderings. (*Whey with tamarinds, succory and burago, pills of camphor and nitre.*)

On the 15th. Prostration of strength, lying on the back, *subsultus tendinum*, eye dead and dusty; skin dirty, earthy, impregnated with a dry and acrid heat. (*The same prescription.*)

The 16th. Prostration extreme, convulsions of the muscles of the face, continual *subsultus tendinum*, general tremblings scarcely any knowledge. (*Cassia water, in other respects the same prescription.*)

The 17th. Situation the same; but a greater degree of debility. He died at three in the afternoon.

Dissection of the body. Remarkable leanness; skin earthy, eyes dusty. The meninges of the brain were in their natural state; the brain itself was very sound; the ventricles contained scarcely a small quantity of serosity; the heart, although free from *coagula*, was in its natural state; the lungs, which were free from all adhesion, were a little unequal in their size; the left was the smallest, and sound; the right more bulky, somewhat firm, and distended with blood of a brown-red colour; its specific gravity was greater than that of water, since it sunk to the bottom. The liver, spleen, and pancreas, were sound; the omentum was adhering to the peritonæum, near the liver; the stomach and intestines were in their natural

state, not exhibiting any red spots, and containing excrementitious matter in very small quantity: the colon was tolerably narrow, but easily dilated; the muscles were of a tolerably deep red; the bones brittle. (MERAT, *Dissertation Inaugurale*, p. 157.)

FINIS.

